

ALL-ATOMIC COMICS

\$1



IS NUCLEAR
POWER THE
ANSWER?

KID, I'D
BET YOUR *LIFE*
ON IT!



BIGGER
IS
BETTER



This is the second edition of a comic book I drew last year about nuclear power and its dangers. This new edition puts more emphasis on encouraging action against nuclear power, rather than merely describing what's wrong with nuclear power.

It was hard for me to overcome my feeling that the experts must know best even after reading thousands of pages of evidence to the contrary. When I was young my teachers taught me to believe and obey them and what they taught me about energy was usually prepared by or with the help of the big energy corporations. I was not taught in school how to challenge industry propaganda or how to observe for myself the workings of the world.

Nevertheless, I'm now convinced that by trusting experts to decide for me I was allowing myself to be exposed to grave risks and that I can no longer trust these experts to make the "right" decisions for me.

We've been told that nuclear power is a "solution" to the energy "problem" as if it were as logical and inescapable as the correct answer to an arithmetic problem. It is no such thing. Nuclear power has moral and social implications that can not be reduced to numbers. The arithmetic problem that nuclear experts have ultimately been working on has usually been how to make the most profit for their employers.

I'm not an expert and I don't claim to know all the answers. What I do claim is that *no one* has all the answers and that *everyone* is responsible for deciding what kind of energy system they will support.

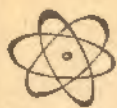
I'd like to thank Will Pozzi, Jim Augustyn, Jim Harding, Mike Shuman, Mark Shepard, Shelby, Alice, Phil, Charly, Dwight, Lorrie, Ken, Celia, Mindy, David, Randy, Rob, Carl, Ron, the cartoonists who helped me, the writers who have inspired me, the people who wrote in suggestions including R. Olaf Stoop, Emma Hartzler, Mark Cherniack, CIDOC, and Fred Schmidt, everyone involved in the nonviolent fight against nuclear power, and anyone careful enough to read all this fine print.

This book is protected by copyright but I encourage anyone to reprint parts of it in any way that might help spread these ideas. When reprinting this material please mention that "This is an excerpt from ALL ATOMIC COMICS, available from Educomics, Box 40246, San Francisco, California, 94140, USA, for \$1.25 a single copy."

I've tried to make certain that all the information in this comic book is up-to-date and true. If you have suggestions for corrections or additions please send them in. I'm solely responsible for the contents of this comic book.

Leonard Rifas
August, 1977

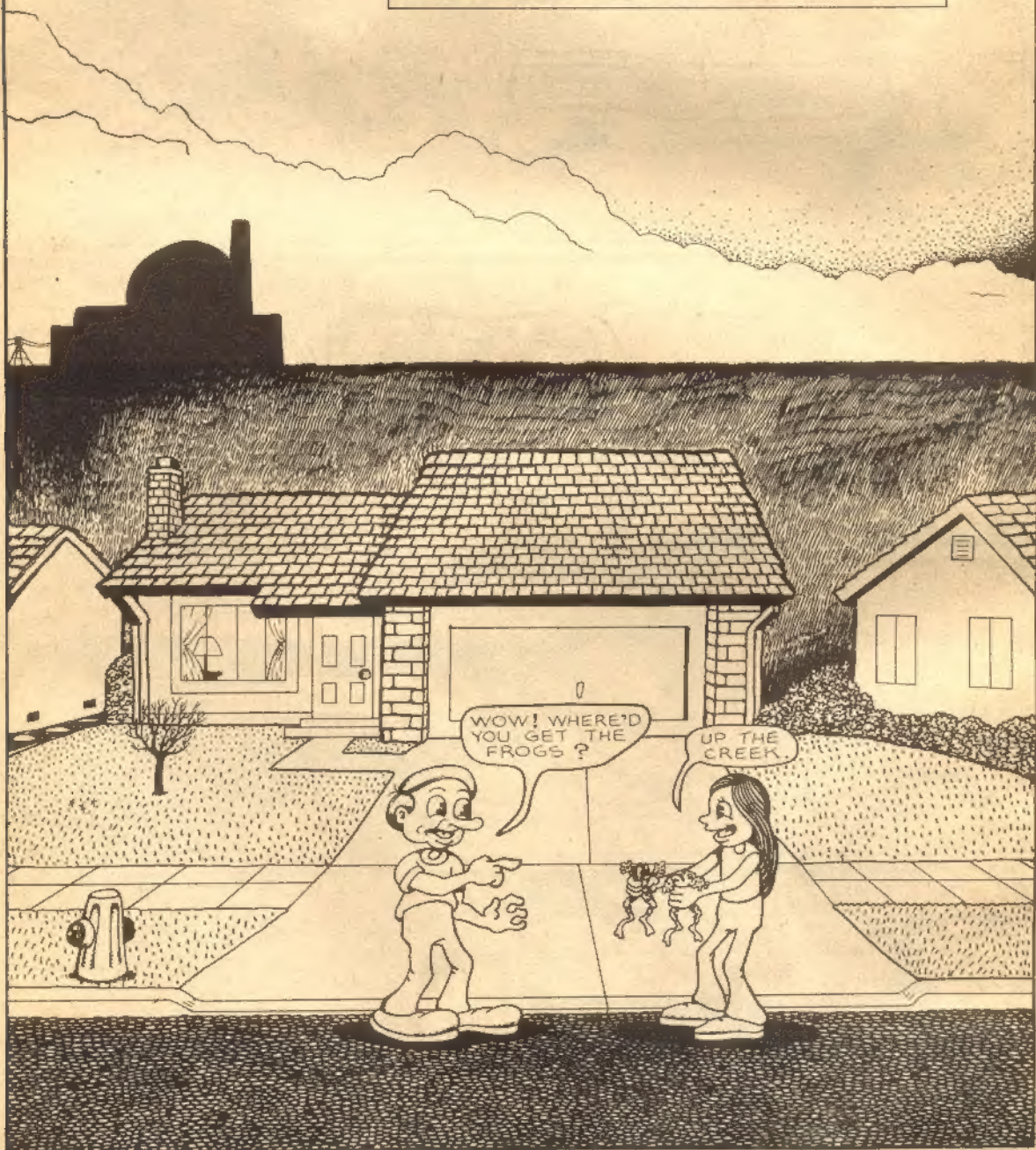
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ATOMICOMICS

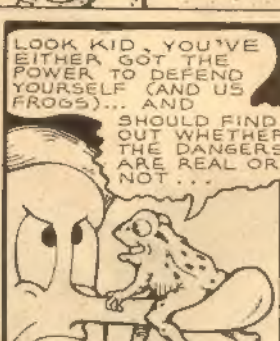
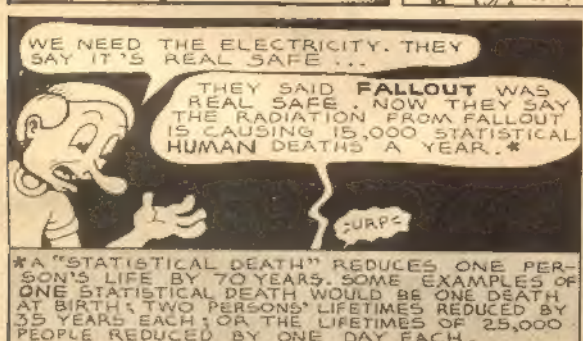
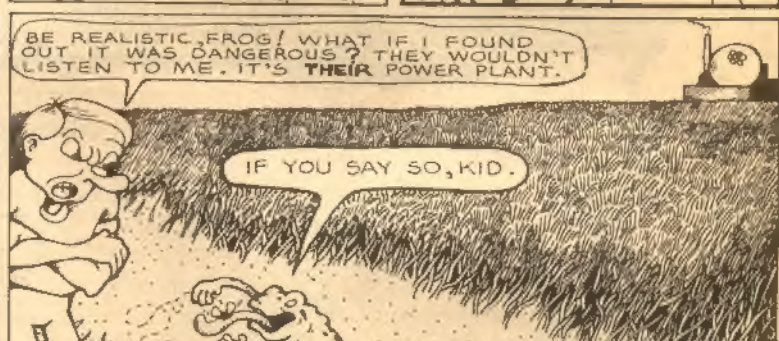
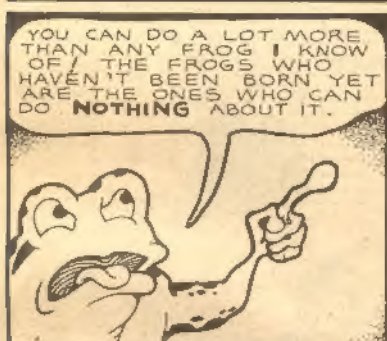
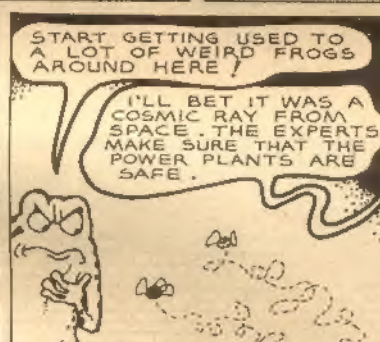
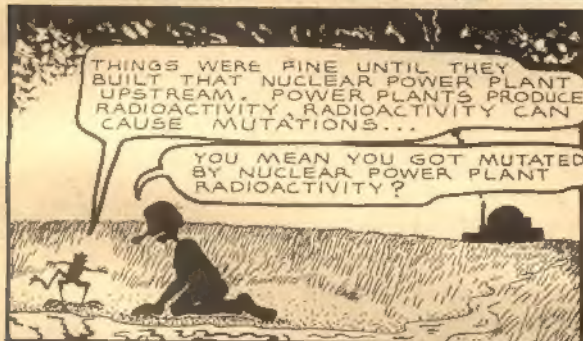


DOES NUCLEAR POWER CREATE MORE PROBLEMS THAN IT SOLVES? SOME PROBLEMS WITH NUCLEAR POWER ARE THE DANGERS OF RADIOACTIVE POLLUTION, THE MASS PRODUCTION OF MATERIALS, THAT CAN BE MADE INTO ATOMIC BOMBS, AND THE HUGE CONCENTRATIONS OF WEALTH THAT NUCLEAR POWER REQUIRES. HOW SERIOUS ARE THESE PROBLEMS? WE HAVE A RIGHT TO KNOW. FOR MANY OF US, NUCLEAR POWER IS ALREADY IN OUR OWN BACKYARDS...

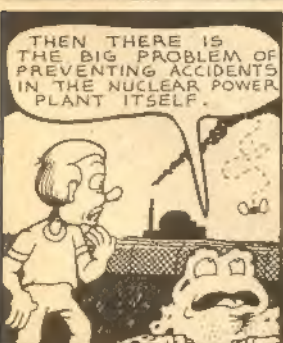
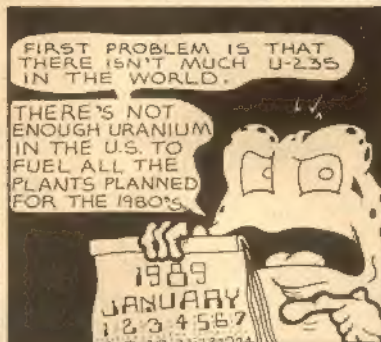
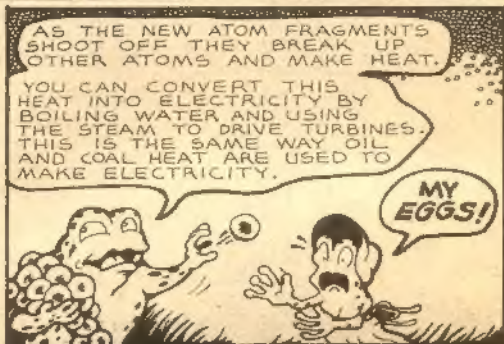
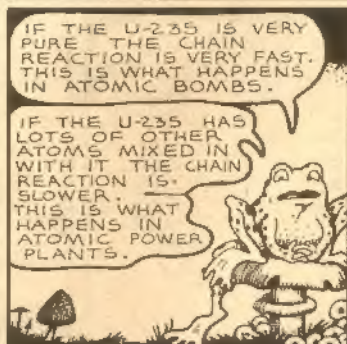
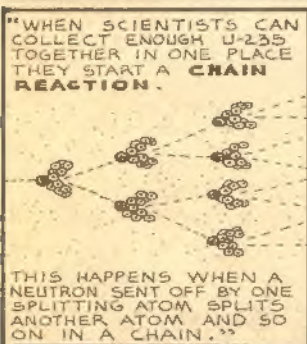
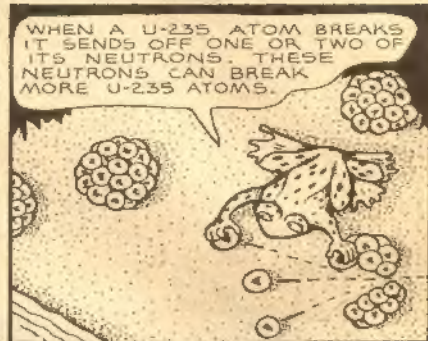
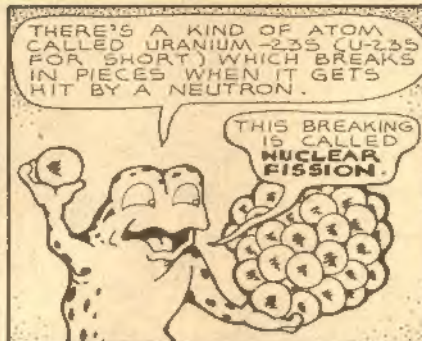


THIS SECOND PRINTING IS DEDICATED TO THE NATIVE PEOPLES OF AMERICA ON WHOSE TRIBAL RESERVATIONS 90% OF U.S. URANIUM IS LOCATED.

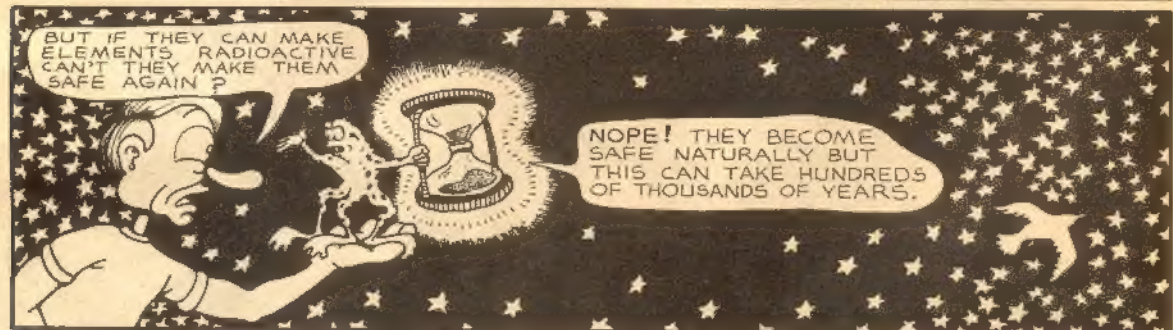
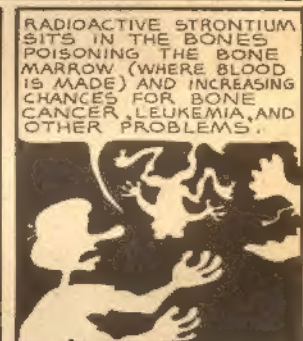
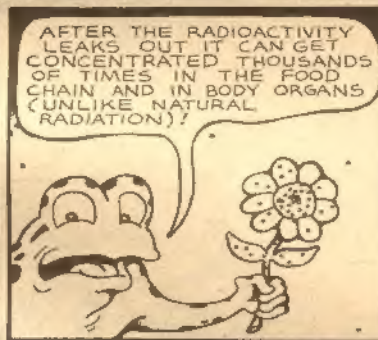
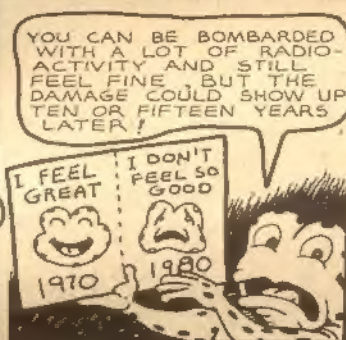
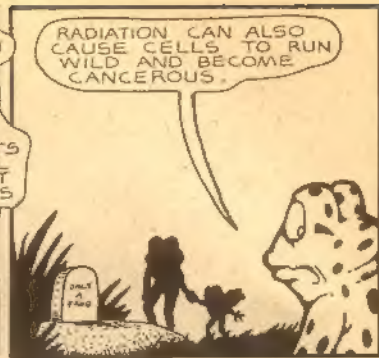
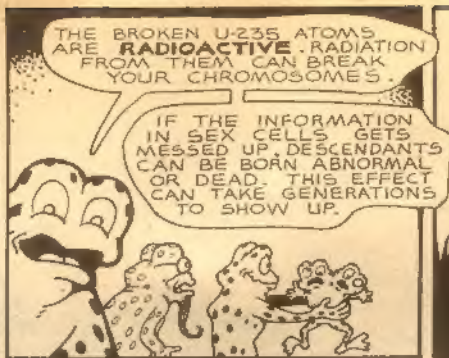
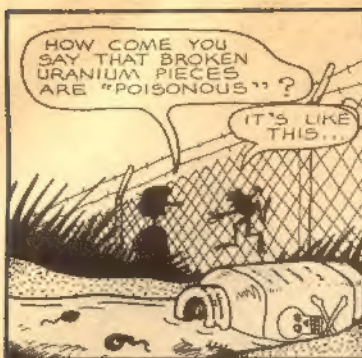
A FROG



HOW IT WORKS



RADIATION



FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER



SAFETY STANDARDS

JOHN GOFMAN AND ARTHUR TAMPLIN WHILE WORKING FOR THE ATOMIC ENERGY COMMISSION CALCULATED THAT IF EVERYONE IN THE U.S. RECEIVED WHAT WAS THEN CALLED A "SAFE" DOSE OF RADIATION, IT WOULD CAUSE 32,000 EXTRA CANCER DEATHS PER YEAR. THEIR STUDIES FINALLY LED TO THE AEC TIGHTENING THEIR RADIATION STANDARDS. THE NEW STANDARDS ONLY PERMIT 1% OF THE OLD ALLOWANCES. DR. GOFMAN HAS CALCULATED THAT A FULLY DEVELOPED NUCLEAR POWER PROGRAM WOULD INCREASE LUNG CANCER DEATHS IN THE UNITED STATES BY 500,000 A YEAR AFTER THE TURN OF THE CENTURY. THIS WOULD INCREASE THE TOTAL U.S. DEATH RATE BY 2.5% (UNDER THE TIGHTER STANDARDS).

ILLUSTRATED BY LEONARD RIFAS

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

CAUSE AND EFFECT

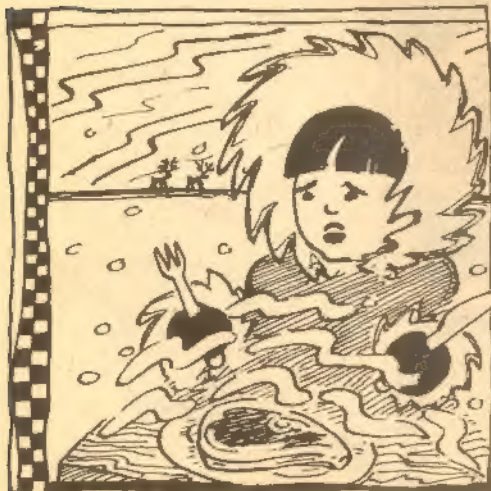
IN 1963, EDWARD J. GLEASON JR., A NEW JERSEY TRUCK DOCK WORKER, ACCIDENTALLY SPILLED PLUTONIUM ON HIMSELF WHILE HANDLING A LEAKING, UNMARKED BOX OF LIQUID WASTE. SHORTLY AFTERWARDS HE COMPLAINED OF FEELING ILL. FOUR YEARS LATER HIS HAND AND THEN HIS ARM AND SHOULDER WERE AMPUTATED BECAUSE OF A RARE FORM OF CANCER, FROM WHICH HE DIED IN 1973 AT THE AGE OF 39. WHEN GLEASON HAD TRIED TO SUE THE COMPANY, THE COMPANY INSURERS ARGUED THAT HE COULD NOT PROVE A DIRECT LINK BETWEEN THE SPILL AND THE CANCER.

ILLUSTRATED BY PETER WEBER



FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

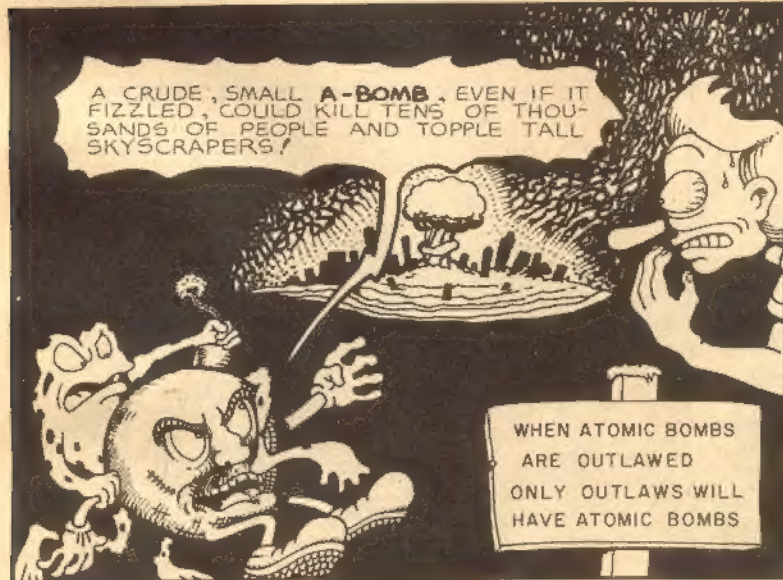
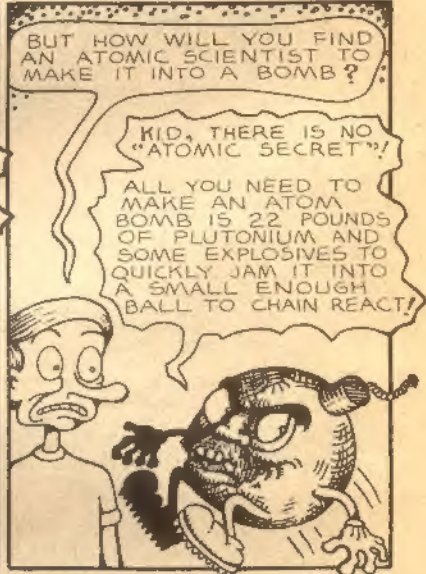
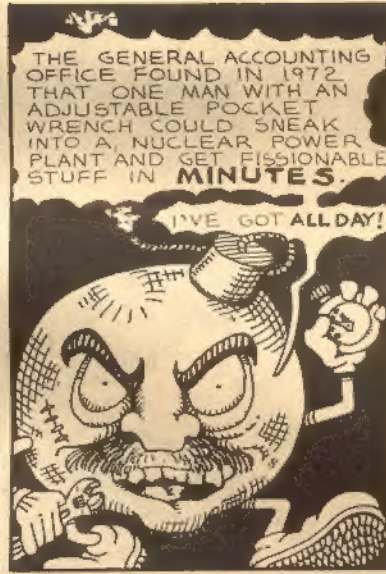
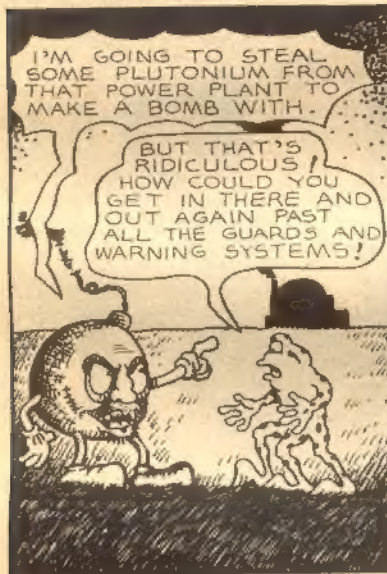
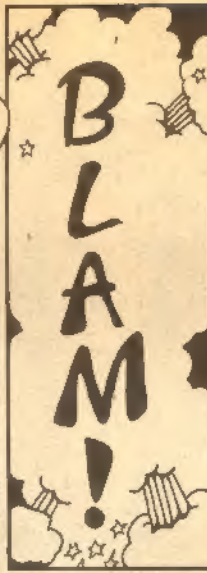
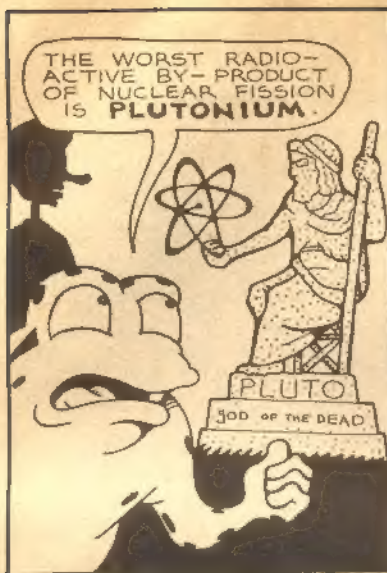
A RADIOACTIVE FOOD CHAIN



TESTING ATOM BOMBS BY EXPLODING THEM IN THE ATMOSPHERE USED TO CREATE A RADIATION HAZARD SIMILAR TO THE HAZARDS OF NUCLEAR POWER RADIOACTIVITY. THE ATOMIC SCIENTISTS DID NOT ANTICIPATE HOW THE RADIOACTIVE FALLOUT WOULD BEHAVE. INSTEAD OF SPREADING EVENLY OVER THE GLOBE IT FOLLOWED THE AIR CURRENTS, THEREBY DEPOSITING MORE FALLOUT OVER THE NORTH TEMPERATE ZONE THAN NEAR THE POLES OR THE EQUATOR. SCIENTISTS DISCOVERED, HOWEVER, THAT EVEN THOUGH LESS FALLOUT WAS FALLING IN THE ARCTIC, THE ESKIMOS THERE WERE RECEIVING DANGEROUSLY HIGHER DOSES OF RADIOACTIVITY THAN THE PEOPLE IN THE TEMPERATE ZONE. THIS WAS BECAUSE THE ARCTIC FOOD CHAIN WAS CONCENTRATING THE FALLOUT. THE LICHENS WERE EXTREMELY EFFICIENT COLLECTORS OF FALLOUT AND ALSO ONE OF THE PRINCIPAL FOODS OF THE CARIBOU. THE CARIBOU, IN TURN, ARE AN IMPORTANT FOOD OF THE ESKIMOS.

ILLUSTRATED BY SHELBY SAMPSON

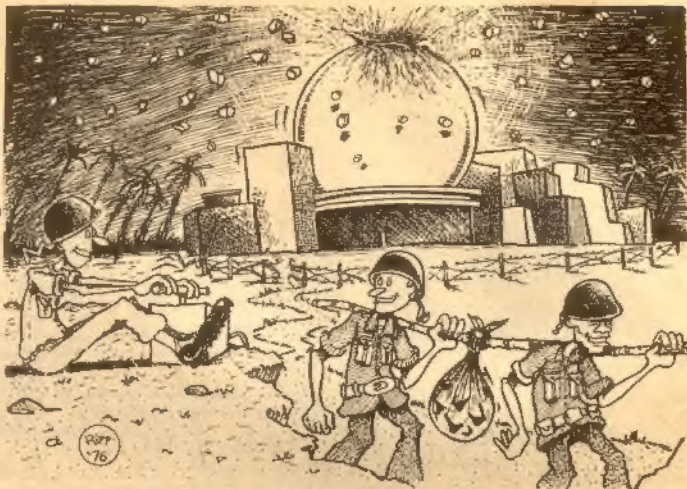
TERRORISM



FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

U.S. DESTROYS VIET A-PLANT

AS THE SOUTH VIETNAMESE ARMY RETREATED IN APRIL 1975, A TEAM OF AMERICANS SECRETLY FLEW TO SOUTH VIETNAM AND DESTROYED THAT COUNTRY'S ONLY NUCLEAR POWER PLANT. THEY REMOVED THE NUCLEAR FUEL AND SENT IT BACK TO THE U.S. SO THE NORTH VIETNAMESE COULD NOT CAPTURE IT AND USE IT TO MAKE AN ATOM BOMB. THEN THEY DYNAMITED THE REACTOR BUILDING.



ILLUSTRATED BY LARRY RIPPEE

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

ATOMIC GANGSTERS

ACCORDING TO A U.S. ARMY PHYSICAL SECURITY REVIEW BOARD REPORT RELEASED IN 1975, "ORGANIZED CRIMINAL ELEMENTS" HAVE STOLEN THOUSANDS OF AMERICAN MILITARY WEAPONS AND EXPLOSIVES IN THE U.S. AND ABROAD. SOME OF THESE STOLEN ARMS WERE SOLD TO CRIMINALS AND TERRORISTS FOR "HUGE PROFITS". THIS MEANS THAT A PRECEDENT HAS BEEN ESTABLISHED THAT MIGHT LEAD TO A REGULAR NUCLEAR BLACK MARKET (IF IT HAS NOT DONE SO ALREADY).



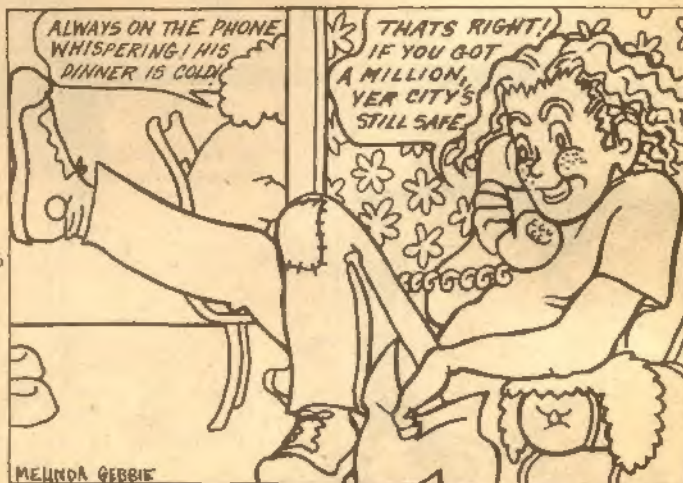
ILLUSTRATED BY KEVIN BRADY

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

NUCLEAR BLACKMAIL

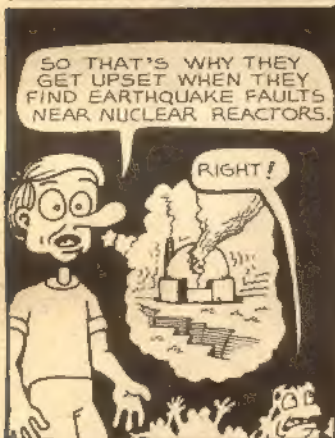
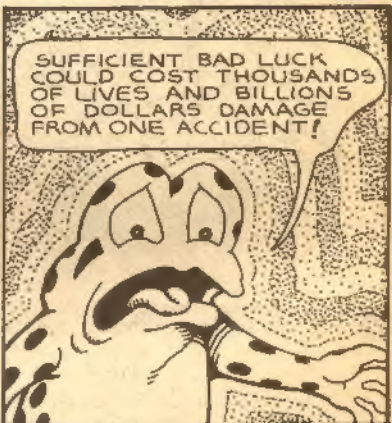
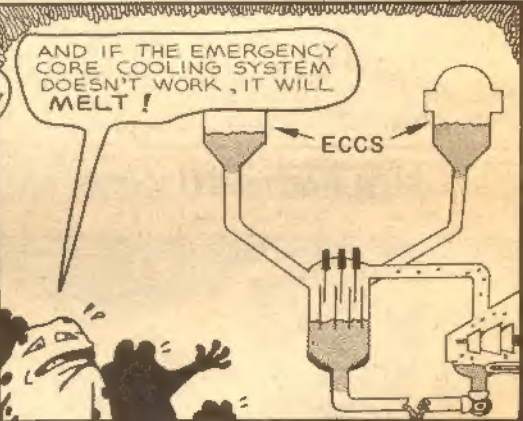
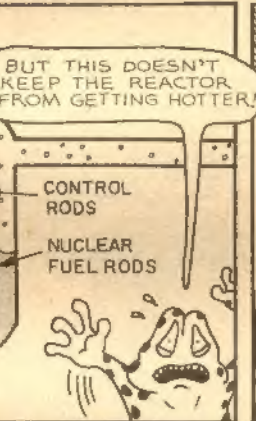
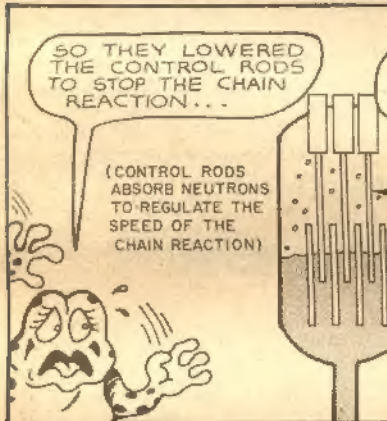
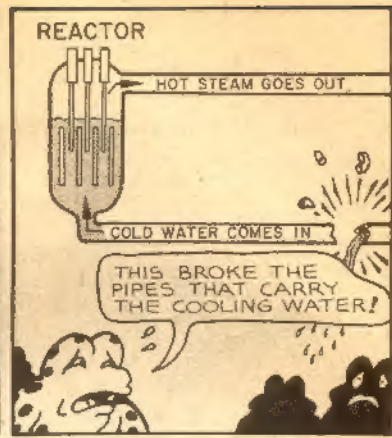
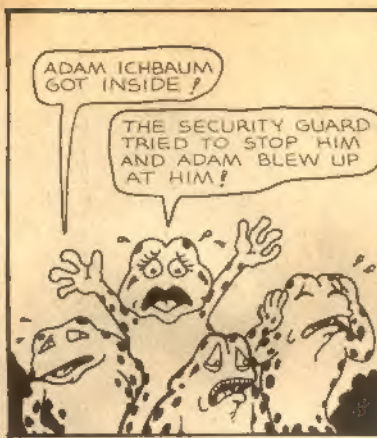
ONE OF THE BIGGEST WORRIES CONCERNING THE NUCLEAR POWER PROGRAM IS THAT FISSIONABLE MATERIAL COULD BE STOLEN AND MADE INTO ATOM BOMBS. ENTIRE CITIES COULD BE THREATENED WITH DESTRUCTION UNLESS THE BLACKMAILER'S DEMANDS WERE MET. IN 1970 A BLACKMAILER THREATENED TO BLOW UP ORLANDO, FLORIDA UNLESS HE WAS PAID ONE MILLION DOLLARS AND GIVEN SAFE ESCORT OUT OF THE COUNTRY. THE DEMAND WAS BACKED UP BY A CONVINCING DIAGRAM OF AN ATOMIC BOMB. THE MONEY WAS COLLECTED BUT BEFORE IT WAS PAID THE POLICE CAPTURED THE "TERRORIST" HE TURNED OUT TO BE A 14-YEAR OLD SCIENCE HONORS STUDENT.

ILLUSTRATED BY MELINDA GEBBIE

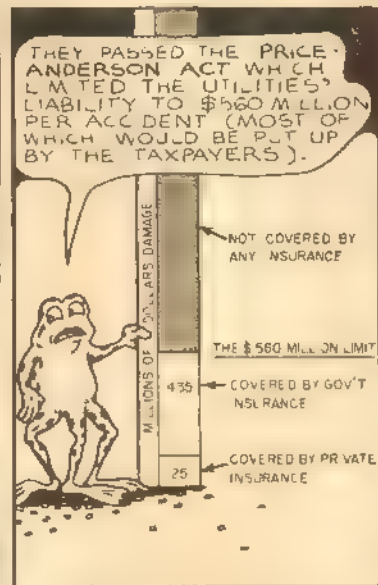
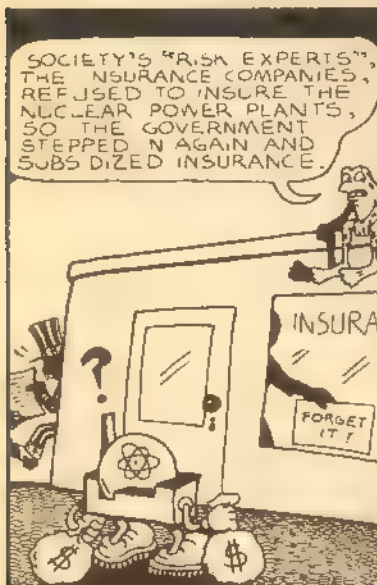
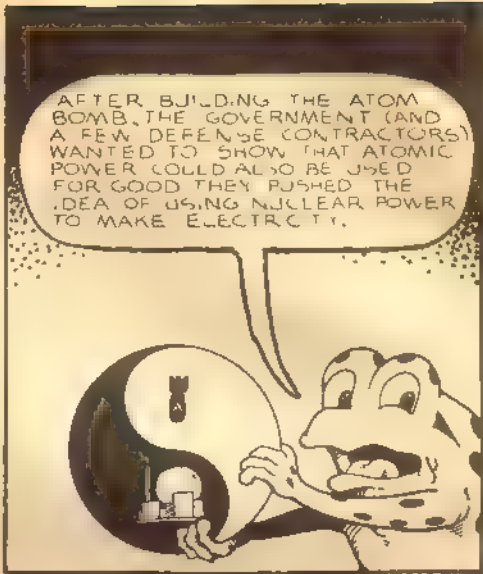
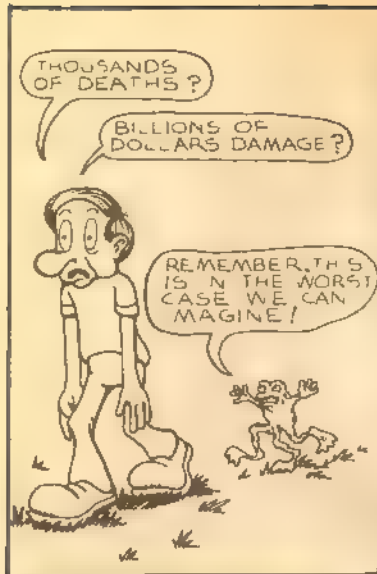


MELINDA GEBBIE

SAFETY



INSURANCE



FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER



FERMI

ON OCTOBER 5, 1966, THE ENRICO FERMI NUCLEAR BREEDER PLANT HAD AN ACCIDENT AND PART OF THE FUEL MELTED. THEORETICAL BREEDER ACCIDENT ANALYSES HAD PREDICTED THAT IF MELTED BREEDER REACTOR FUEL JAMMED TOGETHER IT MIGHT EXPLODE, PUSHING THE FUEL RODS CLOSER TOGETHER AND TRIGGERING A LARGER EXPLOSION THIS WOULD RELEASE RADIOACTIVE GAS INTO THE ENVIRONMENT. IF THIS SECONDARY ACCIDENT HAD HAPPENED THE ONLY REMAINING SAFETY PRECAUTION WOULD HAVE BEEN TO EVACUATE THE SURROUNDING AREA.

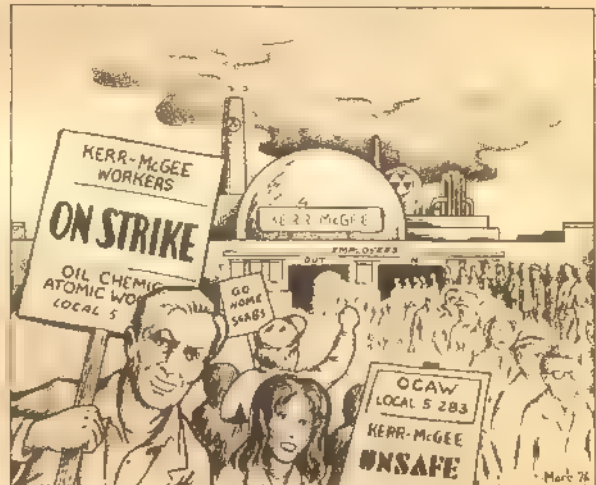
ILLUSTRATED BY ROGER MAY

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

PROFIT VS. SAFETY

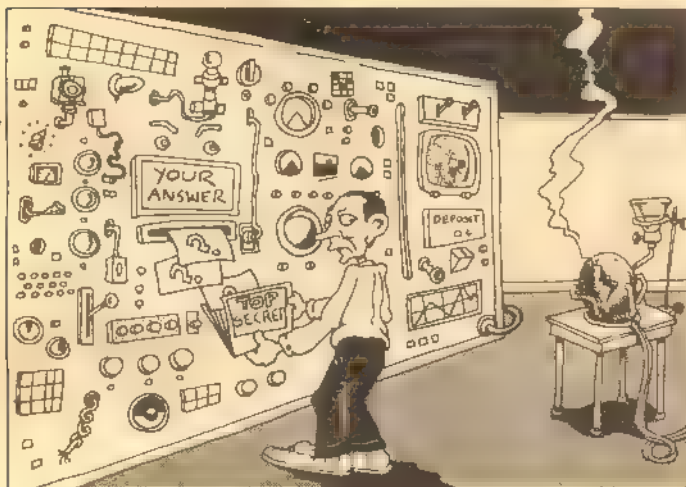
IN 1972, THE PLUTONIUM WORKERS AT AT KERR-MCGEE'S CUMMARON RIVER PLUTONIUM PLANT WENT ON STRIKE THEY WERE DEMANDING A NEW CONTRACT WITH HIGHER WAGES, SAFER WORKING CONDITIONS, AND BETTER TRAINING AS SOON AS THE WORKERS WENT ON STRIKE, THE COMPANY RUSHED SCABS ONTO THE JOB. KERR-MCGEE OFFICIALS LATER ADMITTED THAT THRUSTING UNTRAINED STRIKEBREAKERS INTO THE PLANT HAD LED TO MORE PLUTONIUM SPILLS AND LEAKS.

ILLUSTRATED BY MARC MIYASHIRO



FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

THE E.C.C.S.



A NUCLEAR REACTOR MUST CONSTANTLY BE COOLED BY WATER TO KEEP IT FROM MELTING AND CAUSING AN ENORMOUSLY EXPENSIVE AND POTENTIALLY DISASTROUS ACCIDENT. IN CASE THE WATER FAILS TO KEEP COMING, NUCLEAR POWER PLANTS ARE SUPPLIED WITH AN EMERGENCY BACKUP SYSTEM CALLED THE ECCS (EMERGENCY CORE COOLING SYSTEM). IN 1970, THE AEROSPACE NUCLEAR COMPANY RAN SIX TESTS OF THE ECCS USING A MINATURE MODEL REACTOR CORE. IN EVERY TEST THE COMPUTER FAILED TO PREDICT HOW THE MODEL WOULD REACT. THESE TEST FAILURES WERE KEPT SECRET, NO ONE KNOWS WHETHER THE ECCS IS RELIABLE.

ILLUSTRATED BY LARRY AND LEONARD

SAFETY QUIZ

ON THE LEFT, LISTED ALPHABETICALLY, ARE THE NAMES OF FIVE NUCLEAR REACTORS. ON THE RIGHT, LISTED CHRONOLOGICALLY, ARE DESCRIPTIONS OF FIVE NUCLEAR ACCIDENTS. TRY TO MATCH THE ACCIDENTS TO THE REACTORS WHERE THEY OCCURRED. DON'T WORRY ABOUT GETTING THEM ALL RIGHT. WE ALL MAKE MISTAKES....

FOR ANSWERS TURN
THIS PAGE UPSIDE DOWN

Rippz



1. BROWN'S FERRY
(IN ALABAMA)

A 12-12-52 OVER A MILLION GALLONS OF HIGHLY RADIOACTIVE WATER FLOODED THE BASEMENT OF THE REACTOR BUILDING.

2. ENRICO FERMI ATOMIC POWER PLANT
(IN MICHIGAN)

B 10-12-57 LARGE AMOUNTS OF RADIOACTIVITY ESCAPED. MILK FROM 200 SQUARE MILES OF NEIGHBORING FARMLAND HAD TO BE DESTROYED.

3. NRX EXPERIMENTAL REACTOR AT CHALK RIVER
(IN CANADA)

C 1-3-61 A REACTOR STEAM EXPLOSION KILLED THREE NUCLEAR TECHNICIANS.

4. SL-1
(IN IDAHO)



D 10-5-66 SODIUM COOLANT WAS BLOCKED AND SOME URANIUM FUEL MELTED. "WE ALMOST LOST DETROIT."

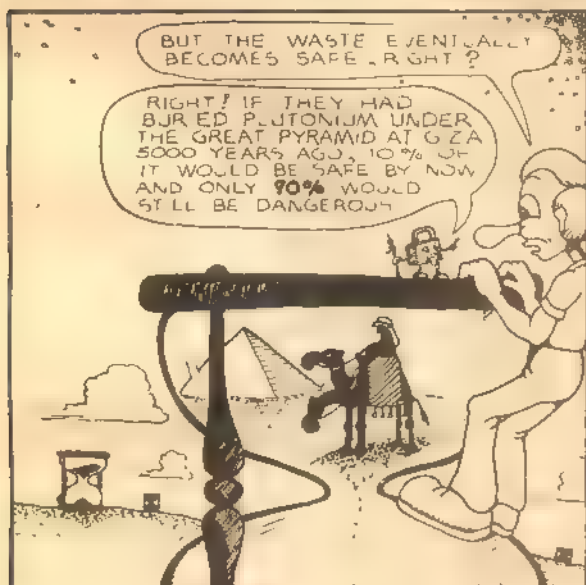
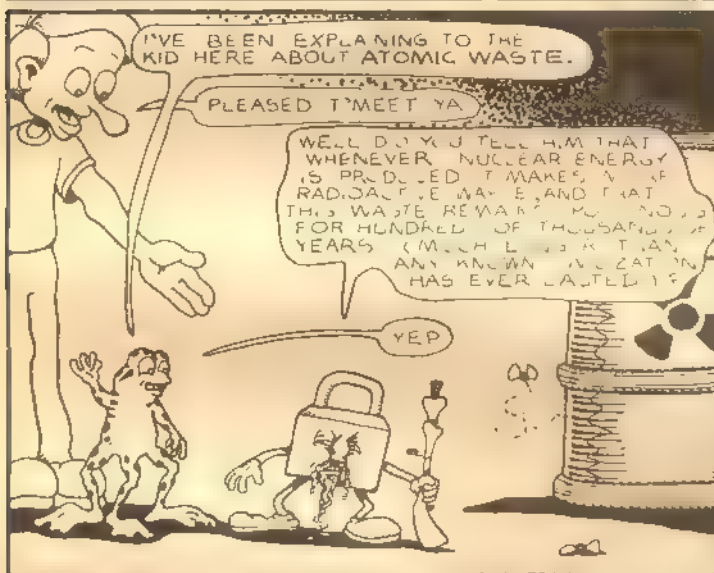
5. WINDSCALE
(IN ENGLAND)

E 3-22-75 A CANDLE STARTED A FIRE WHICH DISABLED MANY SAFETY FEATURES AT THE PLANT.

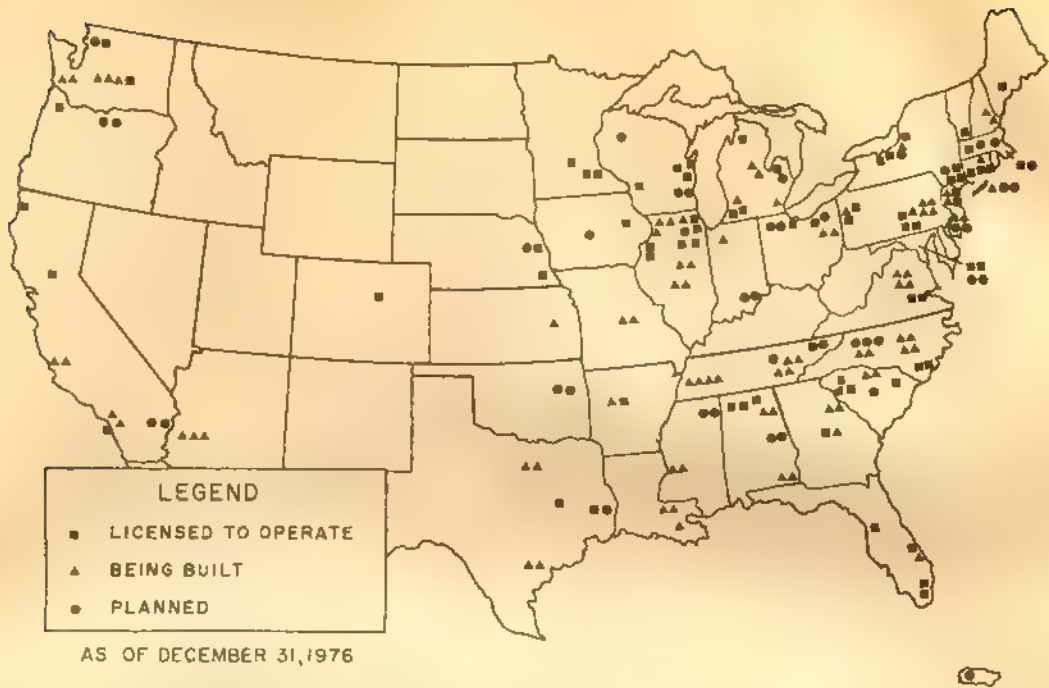
1.E 2.D 3.A 4.C 5.B

ANSWERS

WASTE

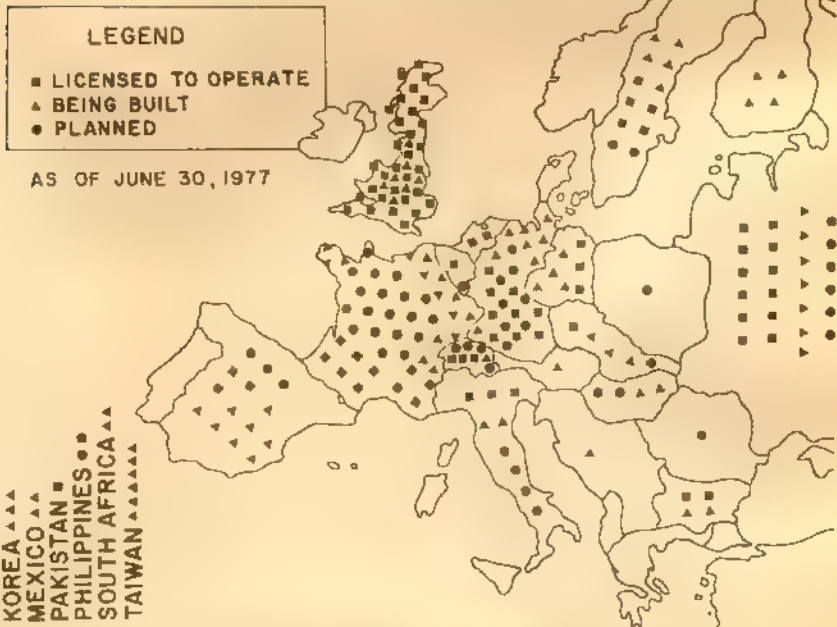


NUCLEAR POWER PLANTS in the UNITED STATES



NUCLEAR POWER PLANTS in EUROPE

SYMBOLS DO NOT MARK EXACT LOCATIONS



NON-U.S. TOTAL (298 UNITS) 90,126 NET MWE
WORLD TOTAL (509 UNITS) 396,733 NET MWE

OTHER NATIONS WITH NUCLEAR POWER PLANTS

ARGENTINA ▲
BRAZIL ▲▲
CANADA ▲▲▲
INDIA ▲▲▲▲
IRAN ●●●
JAPAN ▲▲▲▲▲
KOREA ▲▲
MEXICO ▲▲
PAKISTAN ■
PHILIPPINES ●●
SOUTH AFRICA ▲
TAIWAN ▲▲▲▲▲

NUCLEAR POWER IN THE THIRD WORLD

HAVE YOU EVER SEEN ANYONE GET "DRUNK WITH POWER" ?..

THIS'LL BE A GREAT SITE FOR YOUR COUNTRY'S FIRST NUCLEAR PLANT!

WHEN MY ENEMIES SEE THAT WE'VE GOT THE LATEST AND GREATEST TECHNOLOGY THERE IS, THEY'LL JUST TURN GREEN!

TURN GREEN? NO NO THESE PLANTS ARE SAFE! IT'S JUST THE BOMB! YOU HAVE TO WORRY ABOUT.

AND HOW DO YOU MAKE THOSE?

YOU CAN'T PLAY DUMB WITH ME!

WHAT DID YOU BUY THIS NUKE FOR?

YOUR GOVERNMENT LENT US THE MONEY AND BESIDES A BIG PROJECT MEANS A BIG "COMMISSION"

YOU GRAFTY DEV-!

HEY, DOMINGO! GREAT NEWS!

WE'RE GOING TO BUILD A NUCLEAR POWER PLANT RIGHT HERE!

JOBS FOR EVERYBODY!

SI, SEÑOR

LOTS OF ENERGY TO RUN YOUR TOASTER!

HELL! KNOW WHAT YOU'RE THINKING! YOU HAVEN'T GOT A TOASTER OR ANYTHING TO PLUG ONE INTO BUT JUST YOU WAIT!

AMERICANS WILL COME AND BUILD FACTORIES TO USE THIS GREAT NUCLEAR ENERGY AND YOU'LL HAVE ENOUGH SAVED UP FOR THAT TOASTER IN NO TIME !!

HA HA HA HA HA HA HA

NUCLEAR POWER AND THE THIRD WORLD

The nuclear nations have been exporting reactors all over the globe. They "justify" this with balance of trade arguments and the old "if we don't sell it to them someone else will" moral cop out.

Nations that import nuclear reactors become able to build atomic bombs. As the number of nations that have these weapons increases, it becomes harder to prevent a nuclear world war.

Energy planners in many nonindustrial nations want to generate as much electricity as possible. Growing consumption of electricity, however, is not the same as development towards satisfying

the desires of the people for an easier and fuller life.

Most of the world's people depend on sun and wood for their energy needs and an occasional flashlight or radio battery. An energy plan that would help them better than nuclear power would include reforestation (if not controlled by big landowners), more efficient wood burning and transporting technologies, and new uses of sun, wind, and other renewable energy sources. These could be developed in a way that leaves control of energy in the hands of the people who use the energy.

BY FIDDLEING AROUND WITH THE STAPLES YOU CAN REMOVE THE NEXT FOUR PAGES THAT'S SO YOU CAN HAND THEM TO SOMEONE WHO DOESN'T RELATE TO COMIC BOOKS.

NUCLEAR POWER

The advocates of nuclear power have told us that breaking atoms (nuclear fission) is a safe, clean, cheap, and abundant source of energy. Besides attracting us with visions of the good life that the "magic" and "miracle" of nuclear power can provide, they have also threatened that if we refuse to let them build these plants we will soon "freeze in the dark" as we run out of coal and oil.

Actually nuclear power can *not* provide all of us with a rich life, nor need anybody lack heat or light if we halt all nuclear plant construction.

Besides exaggerating the benefits of nuclear power and spreading false impressions about the "need" for nuclear power, the advocates of this power source have concealed, minimized, and underestimated the *dangers* of nuclear power.

Despite the nuclear industry's attempts to "educate" the public, an increasing number of citizens around the world have been organizing in opposition to these plants. Nuclear advocates sometimes act bewildered by this. They ask, "Why pick on nuclear power?" The following are ten reasons why.

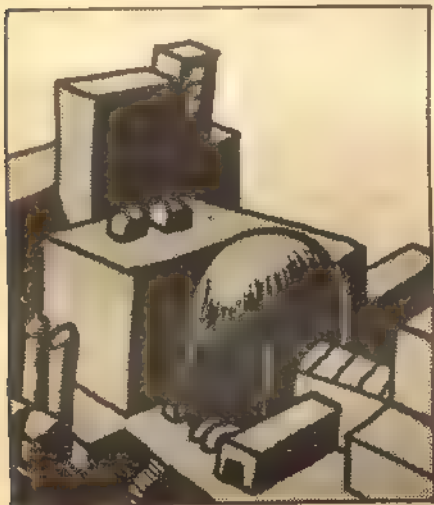


1. Radiation Nuclear power creates enormous amounts of radioactive poisons. Nuclear proponents argue that radiation releases from nuclear plants are negligible compared to natural levels, harmless, and that the cancer risk of plutonium has been greatly exaggerated. The first two of these arguments depend on the nuclear industry maintaining almost perfect control over the poisons they create. As for the third, $1/100$ of a gram of plutonium can kill a person within days from massive fibrosis of the lungs. Far less can cause cancer or birth defects. Plutonium is only one of several radioactive poisons created by nuclear power. Other dangerous fission products include radioactive iodine, and strontium. The nuclear industry propaganda takes advantage of the fact that it is very difficult to prove whether any particular case of cancer was caused by radioactive contamination.

2. Waste The radioactive poisons which accumulate in the reactor must be disposed of in a way which keeps them separate from all living things, yet no solution to this waste problem has been found. Some pro-nuclear scientists argue that the wastes can be solidified and safely stored, but there is no proven method to do this. The US used to dump radioactive waste into the sea assuming the ocean was big enough to dilute it. Some nations still use this method. At Maxey Flats waste dump in Kentucky, plutonium dumped in unlined trenches travelled 800 feet through the soil in less than 10 years. For safety plutonium must be contained for hundreds of thousands of years. At every high-level waste storage site in this country some nearby wildlife has already suffered radioactive contamination.



3. Decommissioning Nuclear power plants have an estimated operating life of 40 years. After this time the reactor vessel and its surrounding structures are radioactive and too dangerous to approach. So far no large reactor has ever been decommissioned. It could cost \$70 million per reactor. A 1976 nuclear industry study said that the best way to decommission plants would be to "mothball" them under guard for 100 years while the worst radioactivity decays and then tear them down and bury the parts as radioactive waste. Since it is unclear who would do this and who would pay for it, nuclear power plants may become waste repositories forever.

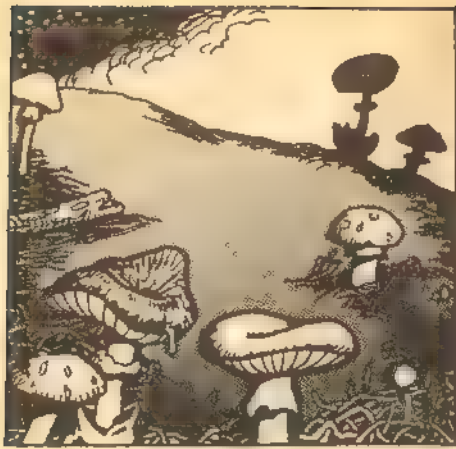


4. Safety A nuclear reactor must be cooled constantly to keep it from melting. A cooling system failure could cause a catastrophic accident. Nuclear promoters admit that one such accident could cause 3300 deaths, 45,000 illnesses, \$14 billion worth of property damage, and contaminate 3200 square miles. Critics say it could be much worse than that. Nuclear defenders quote the Rasmussen report that the chances for such an accident are only one in ten billion per year (with 100 reactors operating). The method used to get this number, however, has been shown to be inaccurate in predicting absolute probabilities. This method predicted that Apollo 4 stage rocket engines would fail once in 10,000 missions but the engine never did better than four failures per 100 missions.

5. Insurance The nuclear industry was originally made possible by the Price-Anderson Act which limited the liability of the nuclear industry and utilities for nuclear accidents. A North Carolina judge recently declared this act to be unconstitutional. No new plan provides sufficient insurance to cover any one maximum credible accident.



6. Terrorism The enriched uranium and plutonium created by the nuclear industry are the basic materials for making atom bombs. Although it can take as little as 22 pounds of plutonium or 37 pounds of highly enriched uranium to make a bomb, as of September 1976 the nuclear industry had lost track of 8000 pounds of these materials. Nuclear defenders say it was not stolen but was all stuck in the machinery and "lost" only by sloppy bookkeeping. Terrorists could make bombs from stolen nuclear materials or they might attack the nuclear plants themselves causing great disruptions and possibly disastrous accidents. Bombs have already been found planted at nuclear power stations. Attempts to guard bomb materials from thieves and power plants from saboteurs may lead to a nuclear police state.



7. Proliferation Another problem with mass producing enriched uranium and plutonium is that countries that import nuclear power plants become capable of building their own atomic bombs. Nuclear power gives a nation skills, knowledge, and equipment that make it easier and faster for them to build nuclear weapons. Further, a civilian nuclear program acts as a "cover", making steps towards building a bomb ambiguous and thus politically easier. The International Atomic Energy Agency's safeguards are inadequate to prevent this from happening. Nuclear power, then, contributes to the likelihood of nuclear war, which is the greatest single threat to our survival.

8. Uranium Shortage Nuclear power plants make energy by splitting U-235 atoms but these are a scarce and vanishing non-renewable resource. The nuclear industry has planned more reactors than can be fueled by U.S. uranium largely because they have greatly over-estimated how efficiently uranium can be fissioned to produce electricity. The "breeder" (if it can be made to work) could not help stretch uranium supplies until around the year 2030. Nuclear power does *not* assure us "energy independence".



9. Inappropriate Energy Infrastructure Electricity is a versatile but expensive form of energy. It is an inefficient use of coal, oil, or nuclear heat. There is no shortage of electricity if we produce it only for those purposes which require it. Instead of trying to further electrify our energy system, we should be seeking new sources of low-grade heat and a replacement for our fossil fuel based transportation system. If we continue to develop a centralized electric power system, then when we run out of uranium we will be a society heavily addicted to huge power plants and desperate for new centralized energy sources. Nuclear advocates say that as we run out of uranium we can switch to breeders and fusion but these are even more expensive ways to make electricity and they may not even work.

10. Jobs and Money A nuclear power system is so expensive to build that it starves all other parts of the economy causing unemployment and inflation. More than a trillion dollars is scheduled to be invested in nuclear power over the next 25 years. By wasting our money building nuclear plants we don't need, we become unable to afford what we do want and need. Although nuclear advocates warn that we need nuclear power to create jobs, money invested in building nuclear plants creates fewer jobs than almost any other way the money could be spent.

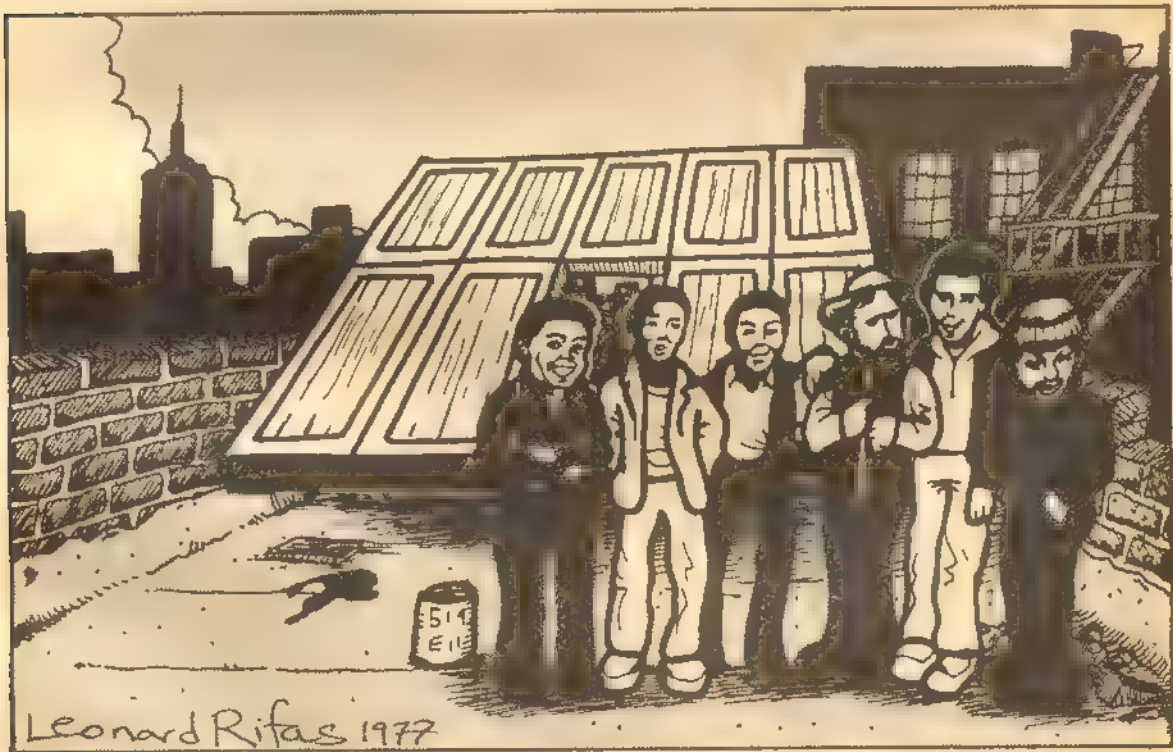


THE ALTERNATIVE

If there is no alternative to nuclear power, or if the only alternatives are coal, gas, and oil, then this would be a depressing article. Fortunately there *are* alternatives. There are energy sources which replenish themselves naturally and which are not exhausted by use. These include sun, wind, and waves. By conserving energy we could stretch our fossil fuel supplies long enough to change smoothly over to a system based on these and other renewable sources.

Naturally the promoters of these new energy sources can be just as wild in praise of their products as the promoters of nuclear power. We should not take their claims at face value. Nevertheless, the prospects are encouraging and the task of developing and applying these sources is urgent.

It is possible for utilities to monopolize solar power. They could use government subsidies to build satellites which would capture solar energy in space and beam it down as microwaves to huge power stations. This would be expensive, ecologically destructive, and politically undesirable. We must remember that the real issue is not nuclear versus solar but how to develop an energy system which is ecologically sane and politically sound. Solar power can be developed in a way which frees us from dependence on energy monopolies or it can be developed by those monopolies in ways which maintain their control.



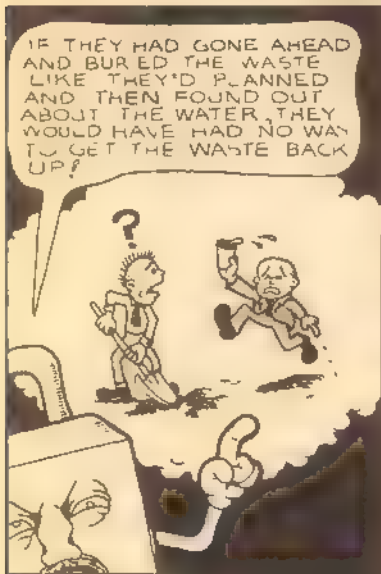
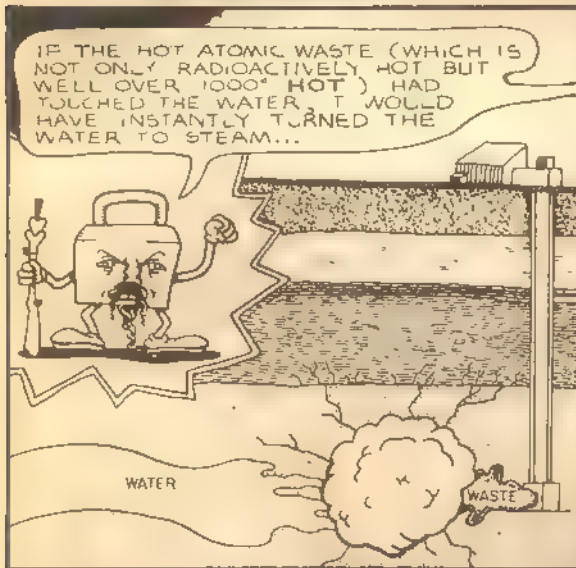
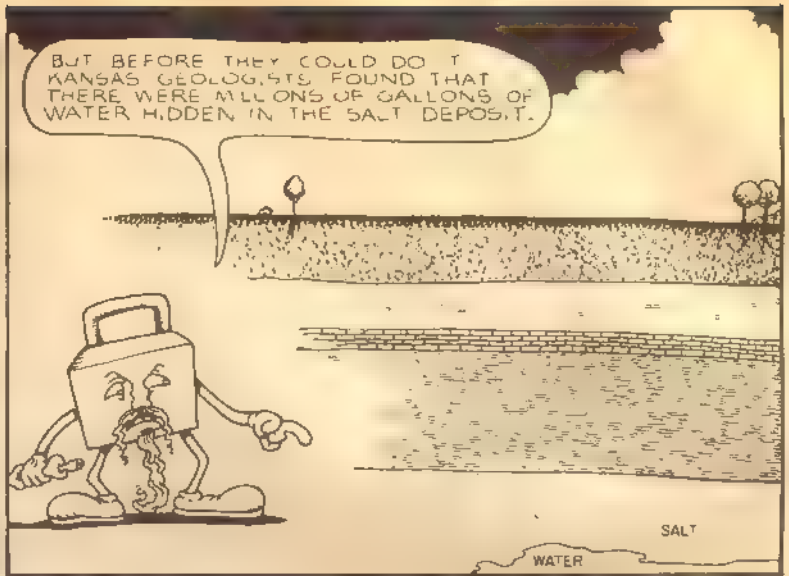
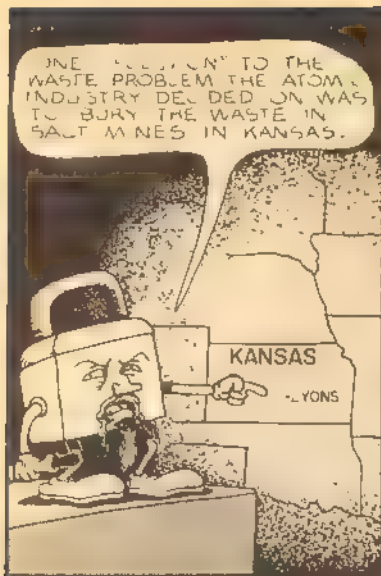
FIGHT

A struggle has been developing over energy policy between supporters of strategies which benefit the few at the expense of the many and supporters of strategies which benefit people more equally.

Those few who would benefit from nuclear power and other monopoly technologies are well organized and determined to fight for their jobs and profits. The alternative systems would spread the benefits of political control, jobs, and savings to a larger but less organized group, namely the rest of us.

Energy decisions generally benefit the ones who make them. If we want decisions to benefit us all we should all get involved in making them.

SALT



TAILINGS

THEN THERE'S SOME OTHER "ATOMIC WASTE" YOU MIGHT NOT HAVE HEARD OF.

WHEN THEY MINE URANIUM ORE, OVER 99% OF WHAT THEY DUG UP IS LEFT OVER AS GRAY SAND LIKE STUFF CALLED TAILINGS.

ARE THEY RADIOACTIVE?

NOT VERY, BUT RADON GAS SEEPS OUT OF THEM AND WILL BE KILLING A FEW PEOPLE HERE AND THERE FOR TENS OF THOUSANDS OF YEARS.

CAUSES LUNG CANCER.

FOR A WHILE THEY WERE USING TAILINGS LIKE SAND IN CONSTRUCTION MATERIALS, ON GOLF COURSES, AND IN CHILDREN'S SANDBOXES.

WHEN THEY'D USE TAILINGS FOR FILL, RADON GAS WOULD SEEP THROUGH THE CEMENT AND BUILD UP INSIDE THE BUILDINGS.

SO THE PEOPLE IN THESE BUILDINGS WERE BEING EXPOSED TO THE SAME RISKS AS URANIUM MINERS.

IN ONE ELEMENTARY SCHOOL BUILT ON TAILINGS IN COLORADO, RADIOACTIVITY WAS HIGHER THAN THE FEDERAL LIMITS PERMITTED IN URANIUM MINES.

TO FIND OUT HOW THE HIGH RADIOACTIVITY COMPARED TO NATURAL LEVELS, THE AEC MEASURED INDOOR RADON IN EAST TENNESSEE AND CENTRAL FLORIDA.

THEY ALREADY KNEW THAT THERE WAS A HIGH NATURAL LEVEL OF RADIUM IN THE SOILS OF CENTRAL FLORIDA.

TO THEIR SURPRISE, THE HIGHEST LEVEL THEY FOUND IN FLORIDA WAS ONLY 1% OF THE HIGHEST EQUIVALENT MEASUREMENT IN COLORADO.

SO GUESS WHAT?

THEY STAMPED THE REPORT: "NOTICE, THIS REPORT IS FOR INTERNAL USE ONLY IT MAY NOT BE PUBLISHED."

THEY BURED IT.

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER



A CONFLICT OF INTEREST

OF THE 6000 MEN WHO HAVE BEEN URANIUM MINERS IN THIS COUNTRY, AN ESTIMATED 600 TO 1,000 WILL DIE OF LUNG CANCER BECAUSE OF RADIATION EXPOSURE ON THE JOB. HUNDREDS OF THESE DEATHS COULD HAVE BEEN AVOIDED BY VENTILATING THE MINES TO KEEP THE RADON GAS FROM ACCUMULATING. THE ATOMIC ENERGY COMMISSION HAD INFORMATION THAT THE UNVENTILATED MINES WOULD CAUSE UNNECESSARY CANCERS BUT THEY CONCEALED THE DANGERS. THEY WERE THE ONLY CUSTOMER FOR THE URANIUM AND EXTRA SAFETY MEASURES WOULD HAVE INCREASED THE COSTS OF THE URANIUM THEY WERE BUYING.

ILLUSTRATED BY MORIA WRIGHT

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

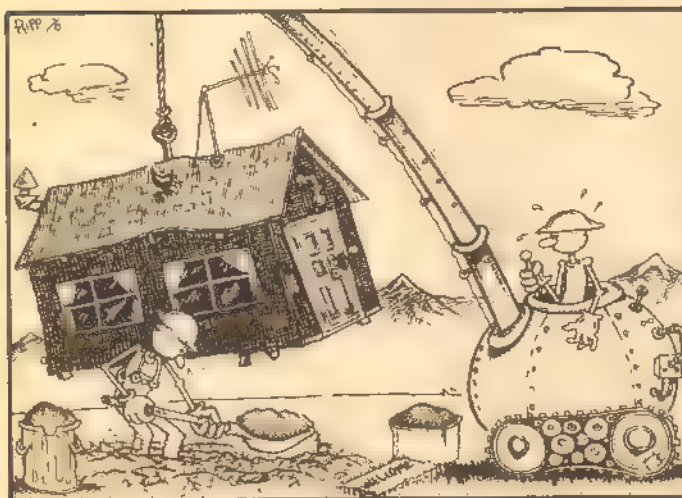
FROG LEGS

THE AMSTERDAM NUCLEAR RESEARCH INSTITUTE DUMPED NUCLEAR WASTE IN A DITCH. BIOLOGIST DR. DIK HILLENJUS SUBSEQUENTLY FOUND FROGS WITH EXTRA LEGS AND OTHER MUTATIONS BEHIND HIS HOME. RADIATION IS KNOWN TO CAUSE MUTATIONS IN ANIMALS AND GENERALLY INFERRED TO CAUSE GENETIC DAMAGE IN HUMANS.

ILLUSTRATED BY LEONARD RIFAS



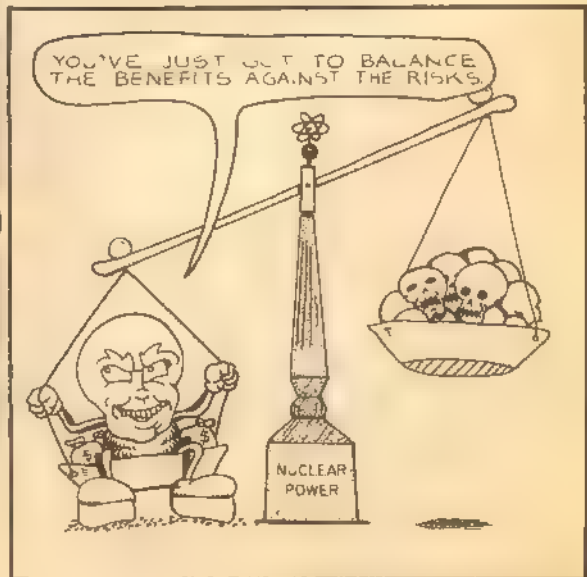
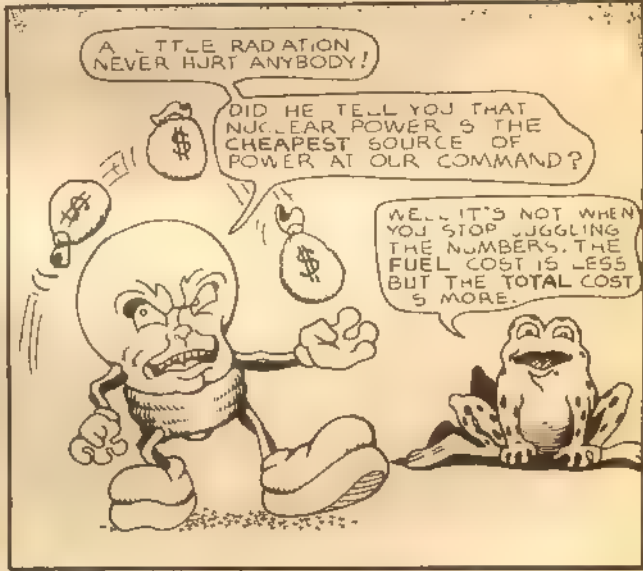
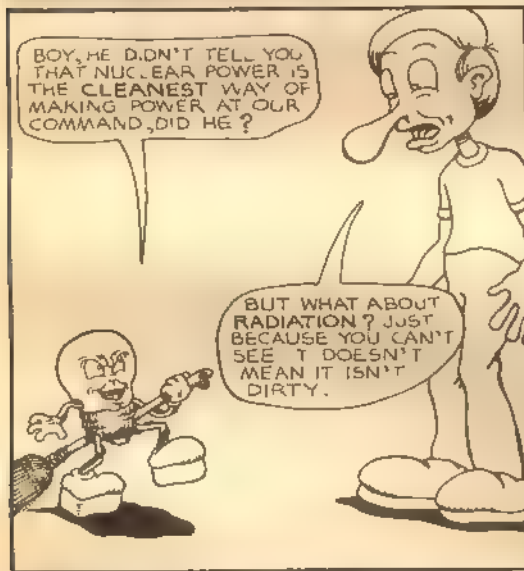
FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER



TAILINGS

WHEN THEY MINE URANIUM 99% OF WHAT THEY DIG UP IS LEFT OVER AS SANDY, GRAY, SLIGHTLY RADIOACTIVE WASTE CALLED TAILINGS. BETWEEN 1953 AND 1966, 8000 BUILDINGS IN COLORADO WERE BUILT WITH TAILINGS IN OR AROUND THEIR FOUNDATIONS. BY 1976 \$1 MILLION HAD BEEN SPENT TO REMOVE THE RADIOACTIVE SAND FROM UNDER THESE BUILDINGS AS A HEALTH PRECAUTION. DAVID COMEY HAS CALCULATED THAT THE RADIOACTIVE DECAY OF THESE TAILINGS WILL CAUSE 394 CANCER DEATHS PER GIGAWATT-YEAR OF ELECTRICITY COMPARED TO ABOUT 50 DEATHS PER GIGAWATT-YEAR FROM SULFUR DIOXIDE EMISSIONS FROM COAL POWER PLANTS.

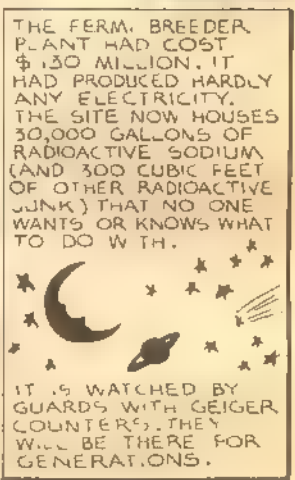
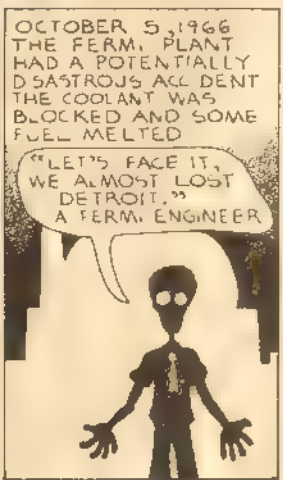
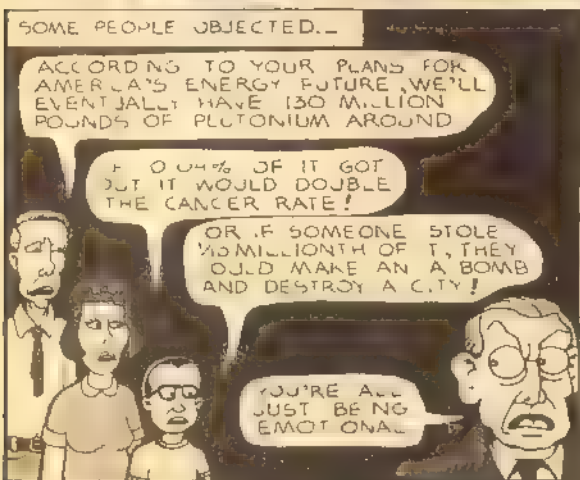
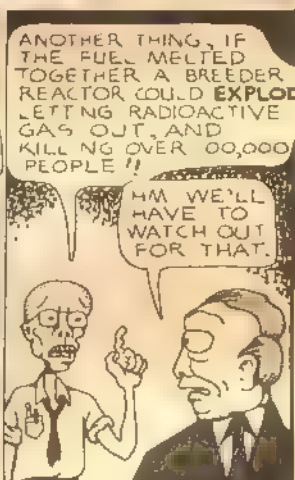
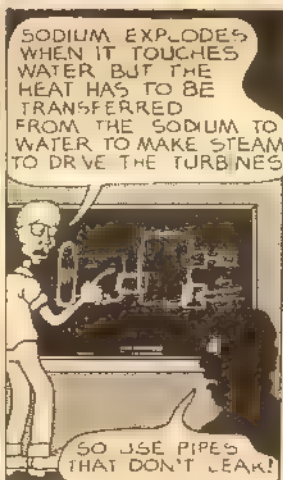
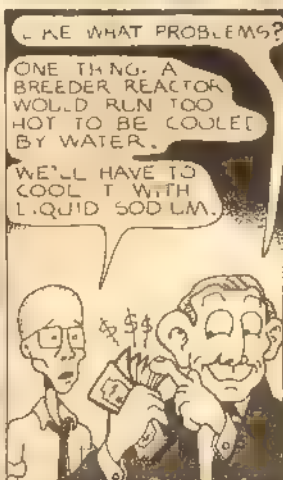
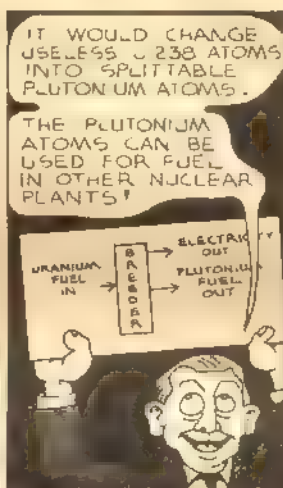
ILLUSTRATED BY LARRY RIPPET



EVERYONE AGREES THAT A NUCLEAR POWER PLANT CAN NOT EXPLODE LIKE A BOMB. THERE IS, HOWEVER, A SPECIAL KIND OF EXPERIMENTAL REACTOR CALLED A "BREEDER" WHICH SOME PEOPLE THINK COULD EXPLODE. BREEDERS WOULD CREATE PLUTONIUM. THE GOVERNMENT IS CURRENTLY SPENDING A LOT TO DEVELOP BREEDERS BECAUSE UNLESS THE NUCLEAR PEOPLE CAN CREATE A PLUTONIUM FUEL SUPPLY, THEIR WHOLE NUCLEAR POWER INDUSTRY WILL SOON GRIND TO A HALT WHEN THEY RUN OUT OF URANIUM FUEL.

BREEDERS

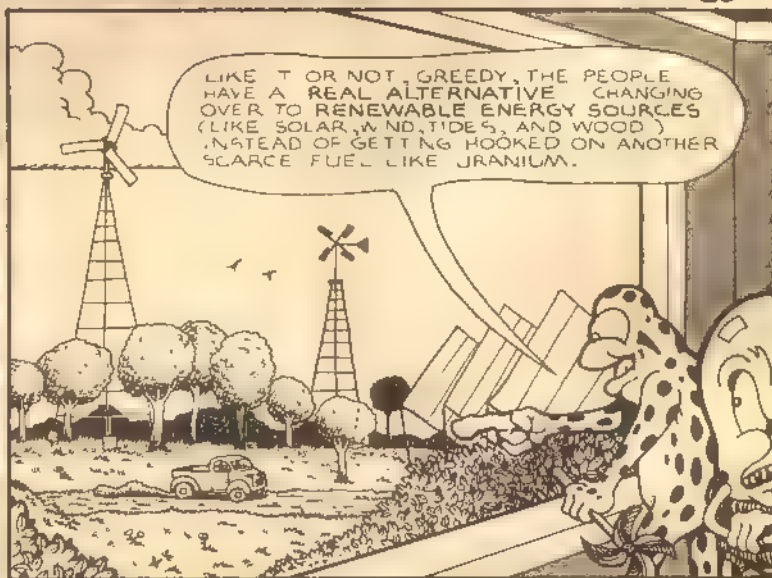
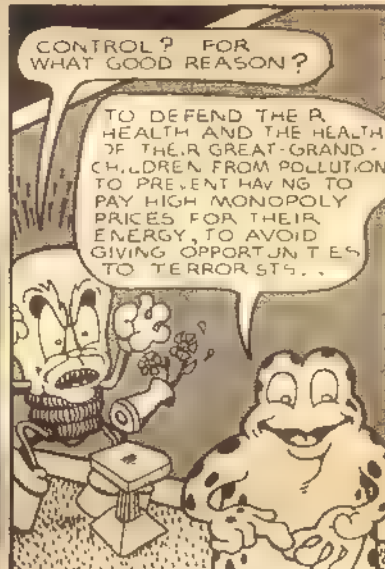
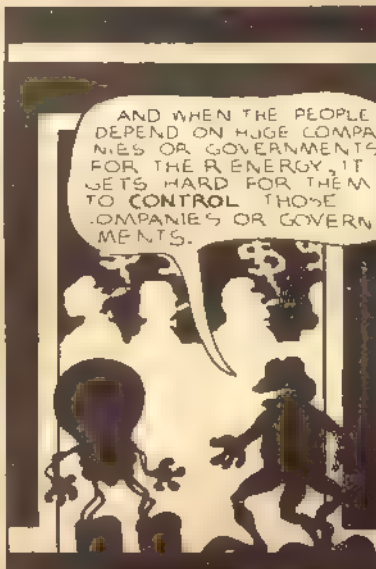
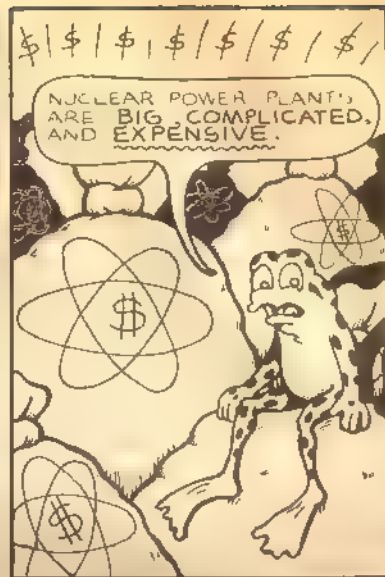
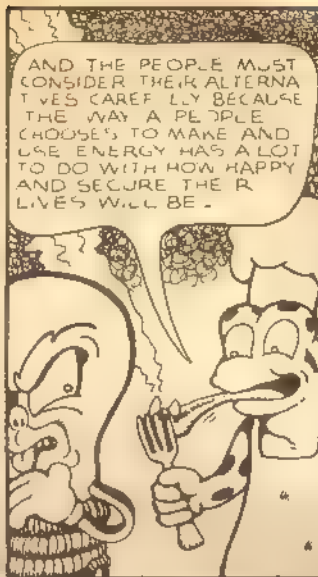
© L. RIFAS



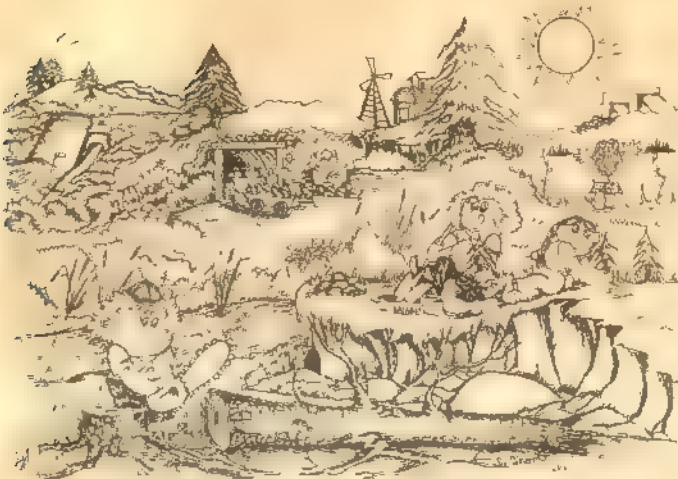
VESTED INTERESTS



ALTERNATIVES



FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER



RENEWABLE VS. NONRENEWABLE

ONE REASON SOME TIMES GIVEN FOR USING NUCLEAR POWER IS THAT WE ARE USING UP EARTH'S COAL AND OIL RESERVES. COAL AND OIL ARE **NONRENEWABLE** RESOURCES. THIS MEANS THAT THERE IS ONLY A CERTAIN AMOUNT OF THEM AND THE MORE WE BURN, THE LESS WE WILL HAVE LEFT. **RENEWABLE** ENERGY SOURCES ARE SOURCES OF ENERGY WHICH CAN REPLENISH THEMSELVES NATURALLY. SOME RENEWABLE ENERGY SOURCES ARE WOOD, TIDES, WIND, FALLING WATER, AND SUNLIGHT. HOW MUCH USE WE MAKE OF THESE SOURCES NOW DOES NOT LIMIT HOW MUCH OF THEM THERE WILL BE IN THE FUTURE. NUCLEAR POWER PLANTS BURN URANIUM FUEL. URANIUM IS A SCARCE NONRENEWABLE RESOURCE.

ILLUSTRATED BY DELORES THOM

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

SILKWOOD

ON NOVEMBER 13, 1974, KAREN SILKWOOD WAS DRIVING TO MEET A REPORTER AND A LABOR UNION OFFICIAL IN OKLAHOMA CITY. SHE HAD WITH HER A MANILA FOLDER FULL OF DOCUMENTS TO SUPPORT HER CHARGES THAT INSPECTION REPORTS AT THE PLUTONIUM PLANT WHERE SHE WORKED WERE BEING FALSIFIED. HER CAR RAN OFF THE ROAD AND SHE DIED. AN ACCIDENT INVESTIGATOR SAID IT LOOKED LIKE A CASE OF HIT AND RUN. TWO FORMER DEPARTMENT HEADS OF THE PLANT RECENTLY CONFIRMED THAT PLANT OPERATION HAD OFTEN BEEN DANGEROUSLY SLOPPY AND IN CONFLICT WITH AEC GUIDELINES.

Read about Karen Silkwood in **CORPORATE CRIME COMICS** (available for \$1.25 from Educocomics)



ILLUSTRATED BY RAY KOTT

FUN FACTS TO KNOW AND TELL ABOUT NUCLEAR POWER

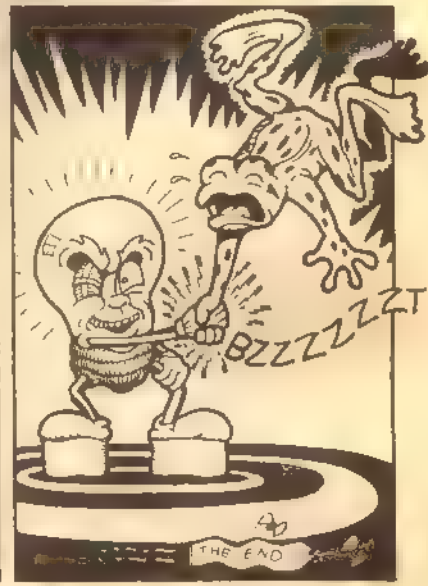
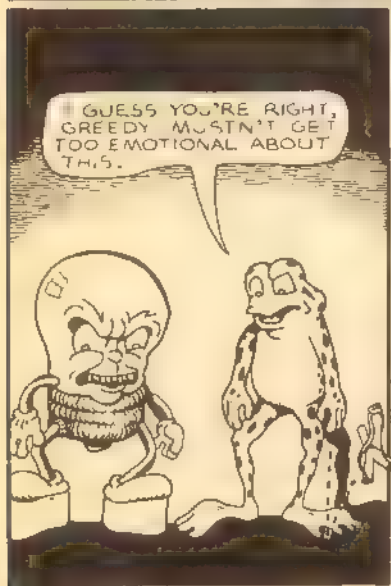
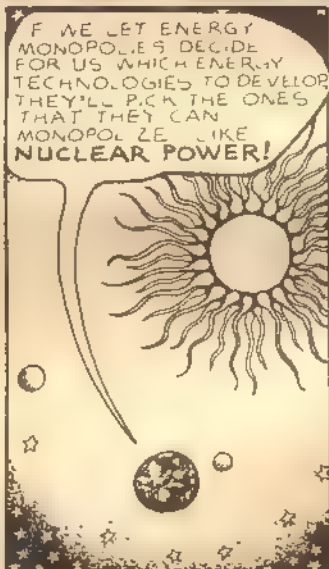
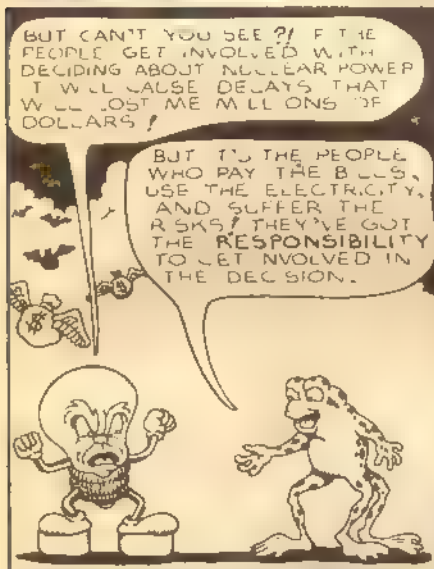
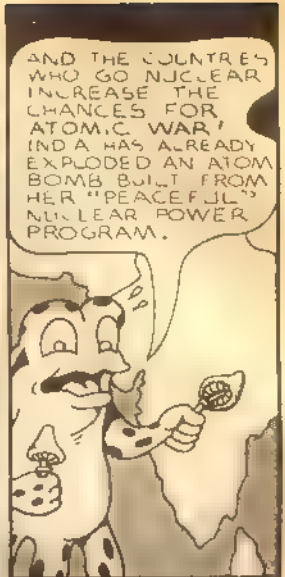
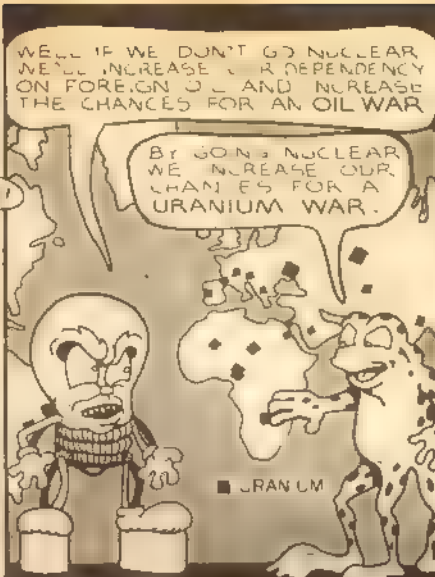


CONSERVATION

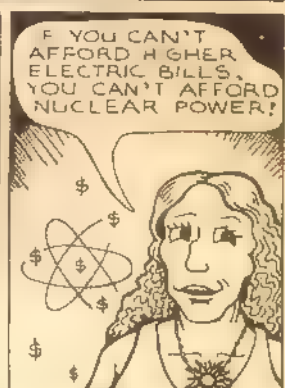
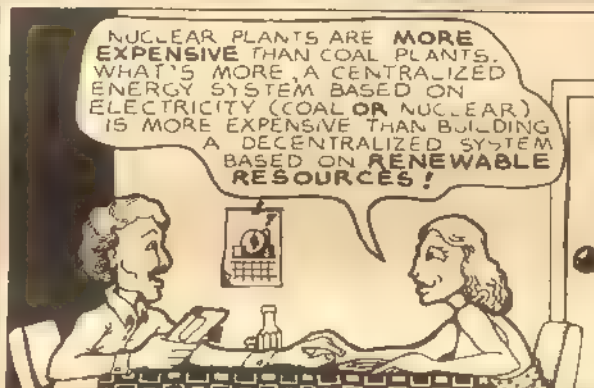
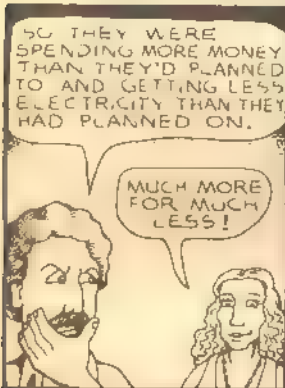
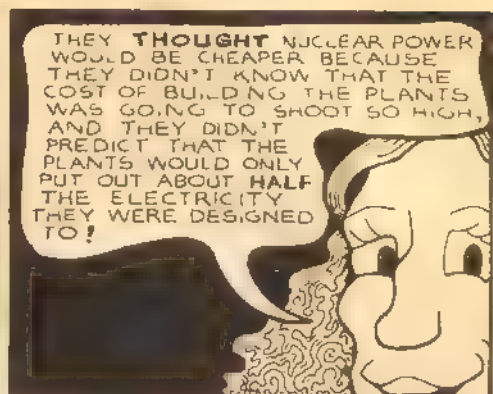
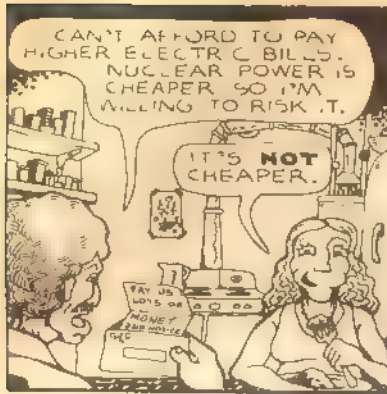
MANY PEOPLE THINK CONSERVING ENERGY ONLY MEANS DOING THINGS LIKE TURNING LIGHTS OFF WHEN THEY'RE NOT BEING USED OR TURNING DOWN THERMOSTATS. THE MORE IMPORTANT WAY TO CONSERVE ENERGY IS BY MAKING SURE THAT THE ENERGY WE USE IS USED EFFICIENTLY. FOR EXAMPLE, ENERGY IS WASTED WHEN IT IS USED TO HEAT BUILDINGS THAT ARE NOT PROPERLY INSULATED. **INSULATION CONSERVES** ENERGY BY CONCENTRATING ON ELIMINATING WASTE INSTEAD OF ON CREATING MORE ENERGY TO BE USED IN THE SAME OLD WASTEFUL WAYS. WE CAN SAVE MONEY, CREATE MORE JOBS AND LESSEN POLLUTION PROBLEMS.

ILLUSTRATED BY LEONARD AND LARRY

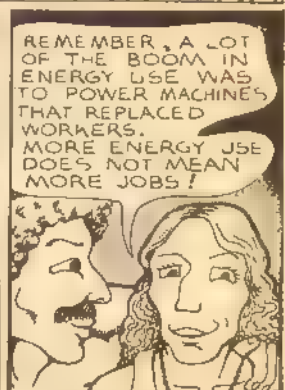
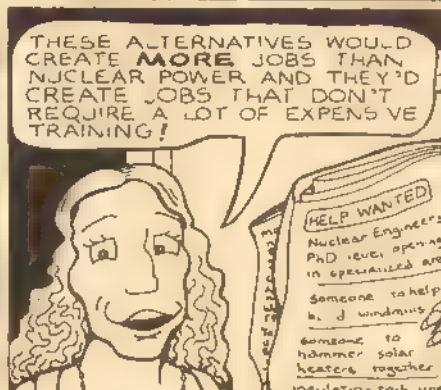
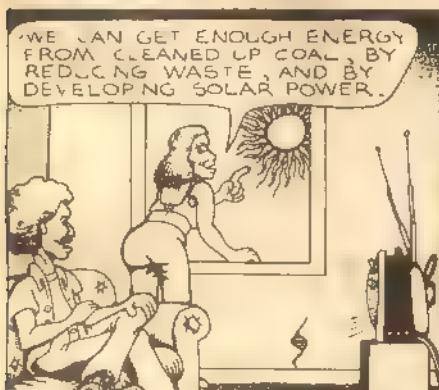
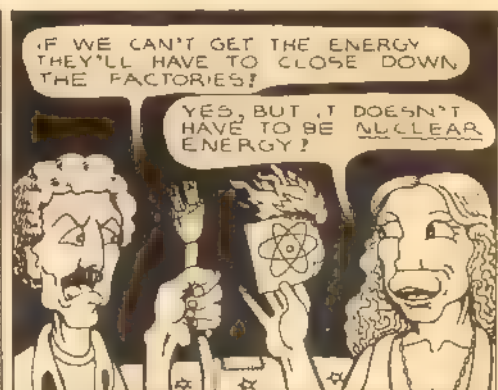
CONCLUSION



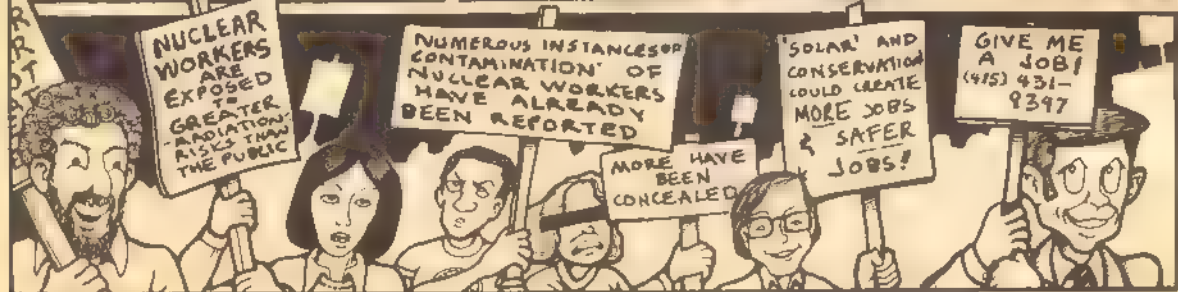
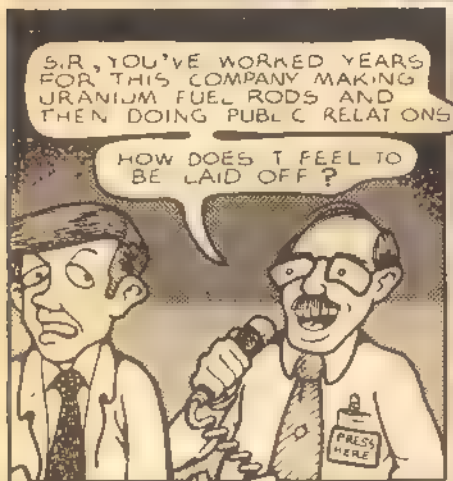
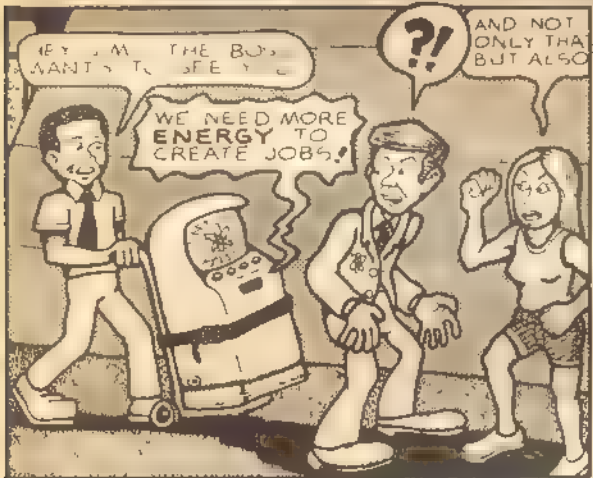
IS NUCLEAR POWER CHEAP?



DOES NUCLEAR POWER CREATE JOBS?

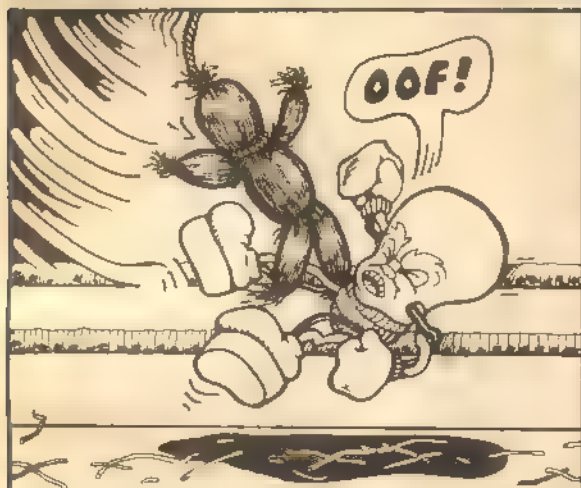
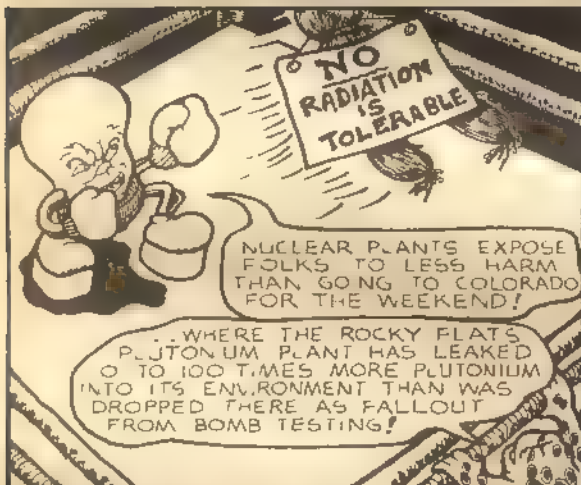
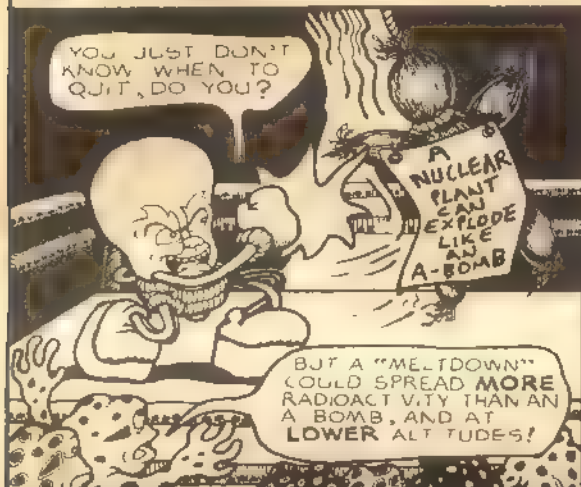


JOBS & ENERGY



Greedy Killerwatt vs the STRAWMEN

STRAWMAN: "AN IMAGINARY ARGUMENT OF NO SUBSTANCE ADVANCED IN ORDER TO BE EASILY CONFUTED OR AN IMAGINARY ADVERSARY ADVANCING SUCH AN ARGUMENT"



HEY, EVERYBODY! HELP KNOCK OUT GREEDY KILLERWATT'S PLANS TO NUCLIFY OUR ENERGY SYSTEM! LET'S UNITE AND GIVE HIM A REAL SPARRING PARTNER HE CAN'T IGNORE! BETTER ACTIVE NOW THAN RADIOACTIVE LATER!

"THE OTHER SIDE"

THERE **ARE** ARGUMENTS IN FAVOR OF NUCLEAR POWER AND WE'D BE NARROW-MINDED AND DOGMATIC TO IGNORE THEM.



SOME PRO-NUCLEAR ARGUMENTS COMPARE NUCLEAR RISKS WITH RISKS OF ALTERNATIVES SUCH AS HYDROELECTRIC AND COAL POWER.

FOR EXAMPLE, **DAM FAILURES** ARE STATISTICALLY MORE PROBABLE THAN MELTDOWN DISASTERS AND HAVE ALREADY KILLED THOUSANDS. THERE IS ONE DAM THAT COULD KILL **125,000 TO 200,000 PEOPLE.**

COAL MINERS ARE KILLED IN **MINE DISASTERS** AND BY **BLACK LUNG**. COAL ELECTRIC PLANTS PRODUCE **DEADLY AIR POLLUTION.**



OTHER "PRO-NUKE" ARGUMENTS STRESS THAT NUCLEAR PLANTS **ROUTINELY RELEASE ONLY VERY SMALL AMOUNTS OF RADIATION** AND THAT NUCLEAR REACTORS CAN'T "EXPLODE LIKE AN A-BOMB."



FOR MANY MORE OF THESE ARGUMENTS SEE PETR BECKMANN'S **THE HEALTH HAZARDS OF NOT GOING NUCLEAR** OR THE MORE CAREFUL BOOK, **THE FIGHT OVER NUCLEAR POWER** BY SCHMIDT & BODANSKY.

HERE'S HOW THE CONTROVERSY OVER PLUTONIUM TOXICITY GOES...

THERE ARE AN ESTIMATED **454 MILLION TO 21 BILLION** CANCER-CAUSING DOSES IN A POUND OF PLUTONIUM.

THOSE NUMBERS HAVE BEEN **REFUTED!**

NO THEY HAVE NOT!

NO HUMAN CANCERS HAVE BEEN PROVEN TO BE CAUSED BY PLUTONIUM!

RADIATION HAS BEEN **INDISPUTABLY** PROVEN TO CAUSE HUMAN CANCERS. PLUTONIUM FROM FALLOUT KILLED AN ESTIMATED **10,000 PEOPLE** AROUND THE WORLD IN 1975!

...AND ON AND ON...



HOW CAN ORDINARY PEOPLE LIKE OURSELVES DECIDE WHICH EXPERTS TO TRUST?

MANY OF US ARE SWAYED BY THE BROADER NATURE OF THE NUCLEAR ISSUE. NUCLEAR PLANTS TYPIFY THE **BIG, COMPLEX, POWERFUL, SECRETIVE, DANGEROUS** FORCES WHICH WE, AS CITIZENS OF INDUSTRIALIZED SOCIETIES, ARE UNEASILY GROWING DEPENDENT ON.



OTHERS OF US JUST FEEL IT'S BETTER TO ERR ON THE SIDE OF **CAUTION.**

TRUE BELIEVERS IN NUCLEAR POWER THINK OPPOSITION TO NUKES IS "IRRATIONAL" AND SO THEY TRY TO FIND **ULTERIOR MOTIVES.**

THEY ACCUSE CRITICS OF BEING **MIDDLE-CLASS ELITISTS** WHO ARE **ANTI-BUSINESS, ANTI-DEMOCRATIC, AND ANTI-TECHNOLOGY.**



I CONFESS **ONLY** TO HAVING BEEN RAISED **MIDDLE CLASS.**

THE HISTORY OF NUCLEAR POWER CLEARLY SHOWS WHO THE **REAL ANTI-DEMOCRATIC ELITISTS** HAVE BEEN!

NO NUKES!

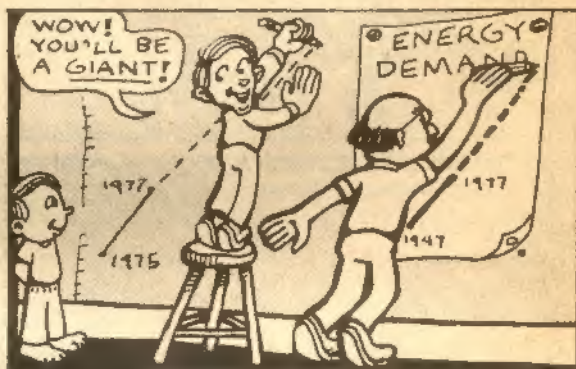
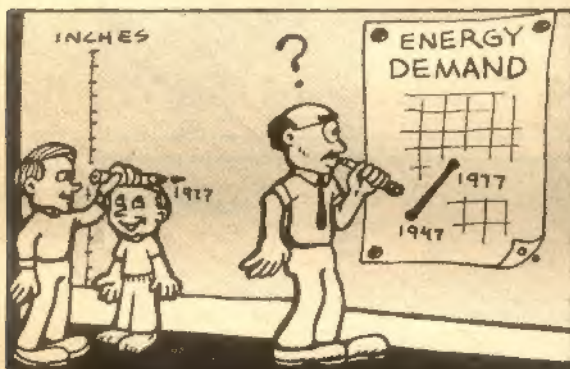
WORKING TOGETHER

Nuclear experts are *not* cold-blooded monsters who sacrifice their own children's health to get rich. This is undeniable. Why, then, do many experts promote nuclear power as a "solution" to world energy "problems"?

Perhaps they are simply taking too narrow a view. They have devoted much research to the question of how we can satisfy our desires for energy, but they have *rephrased* the question as "How can the energy corporations produce the huge quantities of power needed to meet expected demands?"

By looking at the question in this way, these experts ignore or underestimate alternative energy technologies which could form the basis of a new energy system of small power companies serving local communities.

The consistent underestimation of solar, wind, and biomass power and of conservation by these experts is not accidental. Their research is hired directly or indirectly by corporations seeking ways to maintain and increase their power, and *not* interested in funding research about how their monopolies could be broken by a new and better system of small, competitive energy companies.



Experts who focus only on the problem of producing huge amounts of electricity warn that we must choose between the evils of coal or nuclear power. Actually we can free ourselves from dependence on either by using practical energy alternatives.

The objections to nuclear power are not only that it keeps control of the energy we need in the hands of powerful corporations, or that it prevents other technologies from developing. *Nuclear power is intolerably expensive, hazardous, and socially destructive.*

Even if nuclear power *could* produce huge quantities of power (which is unlikely because of capital and uranium shortages), it would not necessarily make things better for the people it is supposed to serve. Increasing amounts of energy produced may simply be used to power machines to replace workers, thus *increasing* poverty and inequality.

The development of safer, less expensive energy technologies does *not* guarantee that these technologies will be used on a significant scale, especially when they threaten the interests of powerful energy corporations.

Powerfully argued objections showing the need for a new energy system are also insufficient to bring about change. Those who profit from the old system will easily satisfy themselves with flimsy and sophisticated rationalizations.

Widespread acceptance of anti-nuclear arguments is also not enough to change national energy decisions which are shaped more by the interests of the existing energy corporations than by majority opinion.

If you decide, after studying the issues involved, that you are against nuclear power, that's fine. But if you want to see a change you must *act*. Fortunately a world-wide anti-nuclear campaign is already at work. Visit the group nearest you!

You may have read this far and still believe that building nuclear power plants is a desirable energy strategy. I hope you will at least agree that nuclear power involves several unique and serious risks and that we should study our alternatives carefully. If this comic book fails to impress you, you may find that the arguments presented in the books listed below could answer your objections. The anti-nuclear case looks stronger when given in detail.

The decision about whether to continue with nuclear power can only be made in the broader context of what goals society chooses to pursue and what energy technologies are available. Each energy technology has its own disadvantages.

So please, regard this comic book as an introduction to the nuclear power question and *read on!*

I highly recommend these books:

Nuclear Power - The Unviable Option, John J. Berger 1976

The Silent Bomb, edited by Peter Faulkner 1977

We Almost Lost Detroit, John G. Fuller 1975

Poisoned Power, John Gofman and Arthur Tamplin 1971

The Curve of Binding Energy, John McPhee 1975

The Atomic Establishment, H. Peter Metzger 1972

The Careless Atom, Sheldon Novick 1969

Unacceptable Risk, McKinley C. Olson 1976

and these which relate to energy problems generally:

The Poverty of Power, Barry Commoner 1976

The Politics of Alternative Technology, David Dickson 1974

Energy, Earth, and Everyone, Medard Gabel 1975

Science, Liberty, and Peace, Aldous Huxley 1946

Energy and Equity, Ivan Illich 1974

"Equity in Useful Unemployment and its Professional Enemies"

Ivan Illich 1977, 36 pages

Tools for Conviviality, Ivan Illich 1973

Soft Energy Paths, Amory B. Lovins 1977

The Electric War, Sheldon Novick 1976

Small is Beautiful, E.F. Schumacher 1973

Power over People, Louise B. Young 1973

I also highly recommend:

The Worldwatch Institute's Worldwatch Paper 6 - **Nuclear Power: The Fifth Horseman** (1976), and Worldwatch Paper 11 - **Energy: The Solar Prospect** (1977) both by Denis Hayes

The Environmentalists for Full Employment's pamphlet, **Jobs and Energy** (They're at Rm 300 1785 Massachusetts Ave. NW, Wash. DC 20036)

and the periodicals:

The Bulletin of Atomic Scientists (1020-24 E. 58th St. Chicago, Ill. 60637 \$18 yr)

Not Man Apart (124 Spear St., San Francisco, Calif. 94105 \$10 yr)

Critical Mass (Box 1538, Dept M, Wash. DC 20013 \$6 yr)

Finally, I recommend the **EARS** catalogue of nuclear and alternative energy information available from EARS, 2239 East Colfax, Denver, Colorado 80206.



Now if you *did* like this comic book and want to get more copies to sell or give away, write to Last Gasp at Box 212, Berkeley, California 94701 or to Educomics at Box 40246, San Francisco, California 94140. 1-9 copies are \$1.25 each, 10-49 are \$.60, 50-99 are \$.50, and 100 on up are \$.40. For discounts on quantities larger than 1000 please write us directly. For free advice on how to produce your own educational comic books on environmental issues write to Leonard Rifas c/o Educomics.

OUR ALTERNATIVES

Energy planners often assume that we must expand energy production to improve the "standard of living." Beyond a certain point, however, more energy use does not improve living standards any more than more food improves health after the body's needs are met. Furthermore, the huge power plants we supposedly "need" are expensive, wasteful, polluting, and vulnerable to disruption by accident or sabotage. The energy corporations' strategies benefit them-

selves while exposing us all to grave risks.

Fortunately we have an alternative. We can develop renewable energy sources (such as sun, wind, and biomass), seriously commit ourselves to conservation and energy efficiency, and make our own decisions locally about how much energy we want and how we can produce it.

The sooner we start working on it, the easier it will be to make a smooth transition to a sensible energy system.



ILLUSTRATED BY RIPP '77
CONCEPT IS LEONARD'S, NATURALLY.